USE OF A DEMAND PREFERENCE ASSESSMENT TO EVALUATE THE EFFECTS OF TASK PREFERENCE ON FUNCTIONAL ANALYSIS OUTCOMES

By

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Abstract of Dissertation Presented to the Graduate School
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USE OF A DEMAND PREFERENCE ASSESSMENT TO EVALUATE THE EFFECTS OF TASK PREFERENCE ON FUNCTIONAL ANALYSIS OUTCOMES

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Recent changes in federal education legislation have led to the increased use of applied behavioral analysis (ABA) techniques in the general education setting. Research in the field of ABA has demonstrated that determining the factors maintaining aberrant behavior, using functional analysis, can lead to more efficient and effective interventions. The literature on functional analysis indicates that very specific aspects of the analysis, such as the type of attention provided or demand presented, may influence results. However, no studies to date have examined the influence of demand preference on functional analysis outcomes. Research on the assessment of demand preference is limited; most of the methods available are based on procedures typically used to evaluate preference for stimuli. The purpose of this study was to develop a systematic procedure to assess students' preference for demands, based on behaviors such as on- and off-task

and the frequency of aberrant behavior. Results of this assessment were then compared to two more commonly used procedures for assessing preference: forced-choice and teacher report. Finally, most and least preferred demands, as identified through the systematic preference assessment, were incorporated in the escape condition of a functional analysis in order to evaluate the influence of task preference on functional analysis outcomes. Results indicated that demand preference does influence functional analysis results. Findings also suggested that task-related behaviors are a more valid measure of demand preference, in particular a duration-based approach, than more traditional measures such as choice. Further research is needed to investigate additional techniques, more suited to the assessment of demand preference.

CHAPTER 1
INTRODUCTION

Overview

Autism is one of five developmental disabilities defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994). In the past, autism was estimated to be a rare disorder, with a prevalence rate of about 2 to 5 cases per 10,000 individuals (American Psychiatric Association, 1994). However, more recent estimates of the prevalence of autism have increased to between 10 and 20 cases per 10,000 (Filipek et al., 1999). Although autism may be on the rise, these increases in prevalence data may also be due, in part, to heightened public awareness of the disorder as well as improved clinical diagnostic criteria (Filipek et al., 1999). Males are four to five times more likely than females to be afflicted with autism (American Psychiatric Association, 1994).

A diagnosis of autism requires a total of six symptoms in the following categories: impairments in social interaction, impairments in communication, and restricted repetitive and stereotyped patterns of behavior, activities or interests. A delay or impairment in social communication, social interaction, or symbolic play must manifest prior to age 3 for a diagnosis (American Psychiatric Association, 1994). The DSM-IV also describes several aberrant behaviors often present in children with autism including aggression, self-injury, and temper tantrums. According to the American

Psychiatric Association (1994), 75% of children with autism also have cognitive functioning in the mentally handicapped range.

The DSM-IV (1994) describes four other diagnoses that fall under the spectrum of Pervasive Developmental Disorders (PDD), also known as Autism Spectrum Disorders (ASD). These include Asperger's Disorder, Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS), Childhood Disintegrative Disorder, and Rett's Disorder. All of these disorders share the common core characteristics described above, to varying degrees. However, the DSM-IV refers to them as separate, distinct diagnoses. For the remainder of this paper, the term autism will be used generically to refer to individuals diagnosed with an ASD.

Many children with ASD have been shown to exhibit aberrant behaviors such as aggression, self-injury, destruction, temper tantrums, bizarre speech, pica, and stereotypy (e.g., spinning objects, body rocking) that are often resistant to elimination through traditional parenting or teaching approaches (Axelrod, 1987; Mace, Lalli, & Lalli, 1991). Such behaviors can be disruptive, and even harmful, for parents and teachers as well as the individual and can lead to segregation into special education or residential settings, thus separating many children with disabilities from their families or peers (Carr & Durand, 1985; Cole & Meyer, 1989; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994).

The 1990 reauthorization of the Individuals with Disabilities in Education Act (IDEA) for the first time designated autism as a separate eligibility category for special education services (P.L. 101-476). This federal law mandates that students with disabilities be educated, to the maximum extent possible, in the least restrictive

educational environment. Schools are required to make every effort to provide supplemental aids and services for such students so that they can be educated along with students who are not disabled. In 1997 President Clinton signed into effect several amendments to IDEA, one of which now requires schools to conduct functional behavior assessments (FBA) when a student with a disability is suspended or receives a change in placement due to behavioral problems (P.L. 105-17). In addition, positive behavioral support strategies must now be incorporated into a student's Individualized Education Plan (IEP) if problem behaviors are occurring that impede the learning process. Positive behavioral support programs attempt to teach students more appropriate behaviors to promote their development rather than solely using punishment-based procedures to eliminate aberrant behaviors (Yell & Katsiyannis, 2000). These recent trends in federal legislation illustrate that the need for behavioral interventions to increase participation of students with autism in the general education setting has never been greater.

Researchers have found that interventions based on pretreatment assessment, using applied behavioral analysis (ABA) techniques, are effective and more acceptable than aversive treatments such as punishment (Axelrod, 1987; Iwata, 1988). Pretreatment assessment is generally aimed at determining the function of a given aberrant behavior (e.g., self-injury during tooth brushing may function to escape the task or aggression in the classroom may function to get attention) so that it can be targeted for treatment. Carr (1977) was the first to suggest that aberrant behavior is learned, rather than random, and that it is exhibited in order to obtain desirable outcomes.

There is a great deal of research demonstrating the effectiveness of designing behavioral interventions based on the function of the behavior rather than the topography

(Iwata, Pace, Cowdery, & Miltenberger, 1994; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993; Wacker et al., 1990). Developing interventions based on the function of behavior can lead to more durable improvements. By teaching students more socially appropriate ways to achieve the same function, the possibility that they will resort back to their original behavior is reduced (Lennox & Miltenberger, 1989).

Several factors have been identified that may motivate an individual to engage in aberrant behavior including gaining access to preferred items, activities, or social attention, referred to as positive reinforcement. When aberrant behavior is maintained by positive reinforcement, a person's behavior is said to have either an attention or tangible function. When aberrant behavior is motivated by termination or escape from a demand or other aversive stimulus, this is known as negative reinforcement. When negative reinforcement is identified as maintaining an individual's aberrant behavior, such behavior is said to have an escape function. Finally, self-stimulation may be identified as the factor maintaining aberrant behavior, which is referred to as automatic reinforcement (Carr, 1977; Iwata et al., 1982/1994). Based on the ideas postulated by Carr, Iwata et al. developed a technique, known as functional analysis, which is used to experimentally evaluate the consequences maintaining aberrant behavior, and thus identify the function of behavior.

Functional analyses have been successful in identifying the functions of various topographies of challenging behavior including self-injury, aggression, destruction, pica, disruption, and stereotypy (Mace, Lalli, & Lalli, 1991). According to Matson, Benavidez, Compton, Paclawskyj, and Baglio (1996), functional analysis has been proven a "powerful tool" in selecting effective treatments for individuals with autism.

The successful application of functional analysis procedures to the treatment of various types of aberrant behaviors suggests "that the function of problem behavior is more important than the form it takes" (Cooper & Harding, 1993, p. 42).

By designing intervention components based on the function of aberrant behavior, individuals can be taught alternative, socially appropriate behaviors to obtain the same reinforcer. This reduces the need for them to engage in aberrant behaviors (Carr & Durand, 1985; Durand, Crimmins, Caulfield, & Taylor, 1989; Wacker et al., 1990) and can potentially facilitate their inclusion in more natural, less segregated settings. Effective behavioral treatments, based on functional analysis findings, can serve to increase these students' participation in the general education classroom as well as decrease aberrant behaviors that may interfere with their successful inclusion.

One potential problem with the use of functional analyses is that during the analysis, inappropriate behaviors are reinforced. Although such reinforcement is short-lived and only occurs during the assessment phase, some parents and teachers are resistant to the use of functional analysis for that reason. Typically conditions are designed in a functional analysis to elicit high levels of aberrant behavior. For example, during the tangible condition the participant is restricted access to highly preferred tangible items and during the demand condition tasks considered to be aversive are typically presented. It remains unclear whether the procedures used during a functional analysis could be modified so that the function of aberrant behavior can be determined without eliciting such high rates or severe topographies of behavior. Research in this area would be beneficial in that it could lead to the increased acceptability of functional analysis methodology.

The research literature surrounding functional analyses indicates that very specific reinforcers maintain aberrant behavior and that a function may not be detected if such reinforcers are not made available (Carr, Yarbrough, & Langdon, 1997). For example, Fisher, Ninness, Piazza, and Owen-DeSchryver (1996) found that the type of attention provided during a functional analysis influenced whether behavior was found to be maintained by access to attention for a child diagnosed with autism. Higher rates of behavior occurred when contingent verbal reprimands were provided but not when followed by contingent neutral statements. Richman and Hagopian (1999) found similar results for two children with mental retardation. Both of the children's original functional analyses were inconclusive. However, when specific qualities of attention were manipulated one of the children displayed more destructive behavior when followed by physical attention, the other when exaggerated negative attention was contingent. Thus, an incorrect conclusion may be drawn regarding a particular function when the specific reinforcers maintaining a behavior are not present.

Mueller, Wilczynski, Moore, Fusilier, and Trahant (2001) evaluated specific qualities of tangible reinforcers during a tangible condition, namely preference for the restricted item as well as preference for another item available noncontingently during each session. Results indicated that preference for the restricted item influenced rates of aggression; however, preference for the alternative item was less influential (i.e., aggression still occurred even if a highly preferred item was noncontingently available). Thus, qualities of both attention and tangible items used in a functional analysis have been found to influence subsequent results.

Procedures for conducting a functional analysis typically include the assessment of preference for stimuli (e.g., items and materials) used during the majority of the conditions included in the assessment (free play, tangible, and attention) (Iwata et al., 1982/1994). For example, during the tangible condition the individual is denied access to a preferred item; during the attention condition preferred items are available; and during the free play condition preferred items and adult attention are available. Thus, all of these conditions necessitate a pre-assessment evaluation of stimulus preference. Preference has been defined a variety of ways in the ABA literature; consensus on one definition is lacking. However, two of the most commonly used indicators of preference for items or activities are the amount of time one spends engaged with an item, compared to other items, and one's choice of an object when it is paired with one or several other items (DeLeon & Iwata, 1996; DeLeon, Iwata, Conners, & Wallace, 1999; Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin, 1992).

Stimulus preference is typically evaluated by having individuals choose between two or multiple stimuli (DeLeon & Iwata, 1996; Fisher et al., 1992) or by measuring whether individuals approach items presented individually (Pace, Ivancic, Edwards, Iwata, & Page, 1985). DeLeon, Iwata, Conners, and Wallace (1999) recently developed an alternative stimulus preference assessment procedure based on the duration of time individuals spend engaged with various items. They presented items singly for two minutes and measured the duration of physical contact with each item. When compared to a multiple stimulus approach-based procedure (MSWO) the duration-based procedure produced slightly more differentiated results and accurately predicted reinforcer effectiveness.

Another method available for assessing stimulus preference is caregiver report. However, research has found that caregivers may not provide accurate information regarding individuals' preference for stimuli, when compared to a more systematic stimulus preference assessment. For example, Green, Reid, Canipe, and Gardner (1991) compared the results of a systematic preference assessment of reinforcers, based on methods developed by Pace et al. (1985), to caregiver rankings of preference. Results indicated no significant correlation between the two assessment methods. The researchers also evaluated the effectiveness of the reinforcers identified by each method and found that while the systematic assessment correctly identified which stimuli would function as reinforcers, the caregivers did not.

Thus, several methods are available and used commonly to assess stimulus preference prior to conducting a functional analysis. However, the selection of the task for use in the escape condition of a functional analysis remains arbitrary and nonsystematic. Specific characteristics of task demands during escape conditions of a functional analysis have been found to influence subsequent results. For example, Iwata, Pace, Kalsher, Cowdery, and Cataldo (1990) found that only specific types of tasks occasioned problem behavior for two participants. One child engaged in self-injury at higher rates when escape from effortful motor tasks (e.g., dressing) was contingent but not when escape from less effortful tasks (e.g., pointing, sorting) was provided. Another child only engaged in self-injury in response to demands present in a medical examination rather than an academic situation. Iwata et al. (1990) suggested "a priori assumptions about what constitutes an aversive event for a given individual may be just as erroneous as assumptions regarding positive reinforcers" (p. 17). Thus, assessing

which types of demands are aversive may be necessary rather than arbitrarily selecting a task for manipulation in a functional analysis.

Smith, Iwata, Goh, and Shore (1995) examined the influence of several dimensions of demand including task novelty, session duration, and rate of task presentation on escape-maintained self-injury. Results indicated that all three dimensions can serve as establishing operations for escape-maintained aberrant behavior. These results illustrate the need to assess specific qualities of demands on an individual basis when examining functional analysis outcomes. Escape from one type of demand may maintain challenging behavior for an individual while such behavior may be seldom seen when different demands are presented. Thus, the particular demand selected for use in a functional analysis may influence whether an underlying escape function is detected.

Several studies have shown that one demand quality, which may influence the rate of problem behavior observed, is demand preference (Foster-Johnson, Ferro, & Dunlap, 1994; Vaughn & Horner, 1997). Foster-Johnson et al. (1994) developed a systematic method to assess task preference and then evaluated the effect of task preference on problem behavior for three students with intellectual disabilities. Results indicated that increased rates of problem behavior occurred for all three students when nonpreferred vs. preferred demands were presented. Vaughn and Horner (1997) also demonstrated higher rates of problem behaviors for four students with severe disabilities during lower preference vs. higher preference academic tasks, regardless of whether the task was selected by the student or the teacher. Thus, preference seemed to exert more of an influence on behavior than choice between tasks, in and of itself.

The preceding studies provide evidence that students may exhibit elevated levels of problematic behavior when presented with less preferred tasks. Traditionally, tasks are selected for use in a functional analysis because they are assumed to be aversive (Iwata et al., 1982/1994). Thus, higher levels of behavior may be elicited compared to a functional analysis in which more preferred tasks are presented. If problem behavior occurs across all types of demands, an escape function could potentially be determined by using more preferred demands, with a possible benefit of not eliciting such high rates of behavior. This could lead to increased acceptability of functional analysis procedures by parents and teachers, who often have difficulty standing by while high rates of severe aberrant behavior are reinforced. On the other hand, discovering that problem behavior only occurs following the presentation of nonpreferred tasks would be useful information as well. It would provide support for the practice of selecting nonpreferred tasks for use in functional analyses. To date, the influence of demand preference on functional analysis outcomes has not been evaluated.

Few studies in the literature to date have systematically assessed demand preference. Studies that have attempted to assess task preference have done so in fairly similar ways. First, tasks are typically identified through interviews with parents and teachers. Next, task preference is directly assessed by having students choose between (Cole, Davenport, Bambura, & Ager, 1997) or rank order (Cooper et al., 1992) various demands. These methods have been successful in differentiating among tasks for many different populations of students. However, for children who may have difficulty communicating preference, such choice procedures are likely to be unsuccessful in evaluating preference. It is also possible that students whose behavior is maintained by

escape from demands may not choose any of the tasks presented or may choose randomly since tasks in general are not highly preferred (Hagopian, Rush, Lewin, & Long, 2001).

Foster-Johnson, Ferro, and Dunlap (1994) developed an alternative method to assess students' preference for demands by measuring their engagement with various tasks, rather than requiring them to make an explicit choice between demands. They presented tasks singly for 30 seconds, following one minute of adult modeling, and then observers made judgments about the extent to which students interacted with the materials, the degree of resistance when materials were removed, and student initiation toward the materials when they were moved a short distance away. Such indicators were then combined into rank orderings for selected tasks. Results indicated that the procedures reliably differentiated between tasks; students engaged in higher rates of appropriate behavior and lower rates of problem behavior when presented with tasks identified as preferred. However, the rankings they used were subjective, based on observers' impressions rather than measures of behavior. No research to date has attempted to rank order tasks according to preference based strictly on student behavior rather than observer impressions.

Having parents and teachers identify which tasks are preferred and nonpreferred is another alternative to asking students to choose between demands. However, whether teachers and parents can accurately report such child preferences is not yet clear. Vaughn and Horner (1997) identified higher preference tasks via a structured interview with the teacher (FAI) combined with classroom observations. They then experimentally validated the results by comparing student choice among tasks identified by teachers as lower preference and higher preference. Students consistently chose the task identified as

higher preference by their teacher and exhibited lower rates of problem behavior when presented with such tasks. Although these results suggested that teachers can accurately report on child preference for demands, further studies are needed to support this finding.

Statement of the Problem

These studies suggest that research is needed to evaluate the influence of demand preference on functional analysis outcomes. Studies have shown that students engage in higher rates of problem behavior when presented with less preferred vs. more preferred demands (Vaughn & Horner, 1997; Foster-Johnson et al., 1994). However, demands selected for use in a functional analysis are typically chosen arbitrarily, based on what is thought to be aversive for the individual. It remains unclear whether differences in the rate of aberrant behavior will occur during the demand condition when more preferred vs. less preferred tasks are presented. It is also unclear whether the same results would be obtained in a functional analysis regardless of whether preferred or nonpreferred tasks are presented. If demand preference influences the rate of problem behavior observed (i.e., lower rates occur with more preferred tasks) but does not change the outcome of the assessment (e.g., behavior is still found to be maintained by escape), then it could be possible to increase acceptability of functional analyses by using more preferred demands and eliciting lower rates of aberrant behavior without compromising results.

Most of the procedures developed for assessing preference for tasks and stimuli require individuals to approach or choose one stimulus over another (DeLeon & Iwata, 1996; Fisher et al., 1992). However, research has found that some individuals are either unable or unwilling to select one item when it is paired with one or several others (Hagopian et al., 2001). More research is needed to determine the best method to

evaluate demand preference for such individuals who may have difficulty making a choice between demands. The engagement-based demand preference assessment procedure developed by Foster-Johnson (1994) and the duration-based stimulus preference assessment described by DeLeon et al. (1999) may potentially be useful as alternatives to forced-choice assessments. However, the criteria used in such studies (e.g., duration of physical contact with items, resistance when materials are removed) seem to reflect preference of task materials rather than the task itself (Foster-Johnson et al., 1994). For example, holding a pencil and writing paper vs. a book is more an indicator of preference for those specific objects rather than for the task of writing vs. reading. Using duration-based methods to assess behaviors such as on-task and off-task may provide a more systematic way to assess preference for different tasks, rather than task materials.

It also remains unclear whether teachers can accurately predict which tasks students prefer to engage in as few studies have been conducted in this area. Finally, since duration-based preference assessments have not been used to assess demand preference, it is also not yet known whether students' stated preference (e.g., choice between tasks) would differ from their observed behavior (i.e., time spent on- or off-task).

Purpose of this Study

This study is intended to address the following questions:

1. Are teachers' reports of students' task preferences in agreement with observed student task preference based on an experimental duration-based demand preference assessment?

2. Are teachers' reports of students' task preferences in agreement with observed student task preference based on an experimental forced-choice demand preference assessment?

3. Is a duration-based demand preference assessment approach, combining measures of duration of on- and off-task and rates of problem behavior, successful in identifying more preferred and less preferred tasks?

4. Are the results of a duration-based demand preference assessment in agreement with the results of a forced-choice demand preference assessment?

5. Are there differences in functional analysis outcomes (e.g., rate of aberrant behavior) when the most preferred vs. the least preferred tasks, as identified via the experimental preference assessments, are presented during the escape condition?

CHAPTER 2
LITERATURE REVIEW

Overview

Autism is a developmental disability defined as a series of behavioral symptoms in the following areas: impairments in social interaction, impairments in communication, and restricted repetitive and stereotyped behaviors, activities, or interests (American Psychiatric Association, 1994). According to recent prevalence estimates, autism afflicts between 10 and 20 individuals per 10,000 (Filipek et al., 1999). There are four other disorders that fall under the category of Autism Spectrum Disorders (ASD) including Asperger's Disorder, Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS), Childhood Disintegrative Disorder, and Rett's Disorder. Each of these disorders includes symptoms in the three core areas described above. However, they are considered separate, mutually exclusive diagnoses (American Psychiatric Association, 1994).

Children diagnosed with ASD are more likely than their nondisabled peers to exhibit aberrant behaviors such as self-injury, destruction, aggression, disruption, pica, inappropriate vocalizations, temper tantrums, and stereotypy (e.g., body rocking, object spinning) (Axelrod, 1987; Mace et al., 1991; American Psychiatric Association, 1994). Such behaviors often result in severe negative consequences such as harm to the individual from self-injury, harm to parents, teachers, and peers as a result of aggression, or disruption of the school or home environments (Carr & Durand, 1985; Iwata et al.,

1982/1994). In addition, high levels of aberrant behavior can sometimes lead to isolation in self-contained classrooms or residential treatment settings (Cole & Meyer, 1989).

Recent federal legislation has led to the designation of autism as a separate eligibility category for special education services (IDEA, 1990). Although the aberrant behaviors displayed by many students with ASD can interfere with their learning and that of their peers, this legislation requires schools to provide the necessary supports and services, including positive behavioral programs, to ensure that these students are, to the maximum extent possible, educated in the same environment as their nondisabled peers. The 1997 reauthorization of IDEA mandated the use of functional behavior assessments (FBA) for any student who experiences a change in educational placement due to behavioral difficulties (P.L. 105-17). Now more than ever psychologists with an applied behavior analytic orientation can serve as an excellent resource for school personnel seeking to learn how to conduct FBA's and develop behavioral support plans (Gresham, Watson, & Skinner, 2001).

The field of applied behavioral analysis (ABA) specializes in the assessment and treatment of aberrant behavior exhibited by individuals with developmental disabilities. ABA assessment procedures have been developed which can be used to determine the environmental events that set the occasion for or maintain aberrant behavior (Lennox & Miltenberger, 1989). The hypothesis that individuals engage in aberrant behavior in order to obtain reinforcement, either internal or from the environment, was first suggested by Carr (1977). Although it is difficult to determine why aberrant behavior initially emerges, Carr explained that if reinforcing consequences are provided contingent on such behavior, it becomes a learned behavior, maintained by conditions in the environment.

Thus, although the environment does not cause such behavior to emerge, environmental consequences can ensure its continued occurrence.

According to Carr (1977) there are two general types of reinforcement: extrinsic and intrinsic. Extrinsic, or environmental, reinforcement includes positive and negative reinforcement. Positive reinforcement involves receiving social attention or access to preferred items or activities following aberrant behavior. Negative reinforcement, on the other hand, refers to the removal of negative stimuli, such as demands, in response to aberrant behavior. Intrinsic, or internal, reinforcement was described by Carr as self-stimulation and is often referred to in the literature as automatic reinforcement. The term automatic reinforcement is used to explain aberrant behaviors that develop independent of environmental factors. Subsequent to Carr's seminal work, researchers in the field of ABA have developed assessment techniques designed to determine the consequences that maintain aberrant behavior (Iwata et al., 1982/1994). These assessment procedures have been successful in leading to the development of more effective, efficient, and acceptable interventions (Lennox & Miltenberger, 1989).

Iwata et al. (1982/1994) developed a procedure known as functional analysis, which has become the most widely used ABA assessment method for determining the function of aberrant behavior. In a functional analysis, various consequences for aberrant behavior are experimentally manipulated in order to isolate the conditions under which such behavior is more likely to occur. For example, if a target behavior occurs most frequently when followed by social attention, it can be concluded that the behavior is likely maintained by access to attention. By determining the function of behavior, researchers can design interventions that involve removing the source of reinforcement

for aberrant behavior and making it contingent on more appropriate behavior, such as communication (Carr & Durand, 1985; Wacker et al., 1990). Functional analysis procedures have repeatedly been shown to lead to the development of interventions effective in decreasing or eliminating challenging behavior in both clinical (Iwata et al., 1982/1994; Wacker et al., 1990) and natural settings such as the home (Asmus et al., 1999; Capasso, 2001; Derby et al., 1997) or the school (Cooper et al., 1992; Sasso et al., 1992).

Although functional analyses are the most common experimental analysis conducted in the field of ABA, another analysis technique known as structural analysis has also been developed. In a structural analysis of behavior, various antecedents, rather than consequences, are manipulated in order to assess under which conditions behavior is most likely to occur (Axelrod, 1987). For example, Carr and Durand (1985) examined children's aberrant behavior under different levels of adult attention and task difficulty. Results indicated that aberrant behaviors were more likely to occur during low levels of attention and high levels of task difficulty. A treatment was then developed which involved teaching the students to request task assistance or adult attention, depending on which factors most influenced their behavior. Thus, similar to functional analyses, structural analyses can be effective in isolating environmental conditions associated with aberrant behavior and therefore can assist in developing interventions which involve teaching children alternative behaviors more appropriate for their environment.

Recent research on functional analysis techniques has examined specific qualities of antecedents and consequences present during assessment that may be related to the function of aberrant behavior. According to Carr, Yarbrough, and Langdon (1997), by

following standard procedures for a functional analysis, researchers may overlook specific components of antecedents (e.g., qualities of demands presented) or consequences (e.g., type of attention provided) whose presence can significantly influence functional analysis outcomes. Research in this area has often occurred following inconclusive functional analyses, in which the function of behavior could not be detected and thus researchers were forced to examine more specific components of antecedents or consequences (Richman & Hagopian, 1999).

Several studies have found that the type of attention provided during a functional analysis can influence whether behavior is found to be maintained by access to attention for some individuals (Fisher et al., 1996; Richman & Hagopian, 1999). For example, Fisher et al. provided either verbal reprimands or neutral statements contingent on aberrant behavior during a functional analysis and found that higher rates of behavior occurred when verbal reprimands were presented. Richman and Hagopian found similar results after examining qualities of attention following inconclusive functional analyses for two participants. For one child, higher rates of problem behavior occurred if followed by physical attention, for the other, when followed by exaggerated negative attention. Thus, which specific qualities of reinforcement (in this case attention) motivate aberrant behavior may differ on an individual basis.

Research has also found that specific components of tangible items used during a functional analysis can influence results for some individuals (Mueller et al., 2001). Muller et al. varied the preference of restricted items during a functional analysis for a child with autism whose behavior was found, via a previous functional analysis, to be maintained by access to tangible items. Results indicated that restriction of high

preference items resulted in higher levels of problem behavior, regardless of whether other high preference items were available noncontingently.

Several studies have examined the influence of specific demand qualities on functional analysis outcomes as well (Iwata et al., 1990; Smith et al., 1995). Iwata et al. found that whether a task involved gross (e.g., dressing) or fine motor skills (e.g., pointing, sorting) or included medical versus academic demands may influence rates of problem behavior for some individuals. Task novelty, session duration, and the rate of task presentation during demand conditions of a functional analysis have also been shown to affect whether behavior is found to be escape-maintained (Smith et al., 1995). These studies demonstrate that although specific qualities of demands can influence rates of problem behavior in a functional analysis, which qualities most influence behavior varies across individuals.

One aspect of demands that has not been studied, relative to functional analysis outcomes, is demand preference. Demand preference is important to understand because epidemiological studies have consistently identified negative reinforcement, or escape from demands, as the primary function of aberrant behavior (Derby et al., 1992; Iwata, Pace, Dorsey et al., 1994). However, the way in which the demand is selected for inclusion in a functional analysis may be systematically biasing the results obtained. In addition, extreme rates and severe aberrant behavior may be observed and repeatedly reinforced during a functional analysis. If all demands function as a source of negative reinforcement for an individual with escape-maintained aberrant behavior, it would then be appropriate and perhaps more acceptable to consumers and participants to present demands during the functional analysis that resulted in a lower rate or intensity of

aberrant behavior. In addition, it is possible that by identifying preferred demands during assessment, this information can be used during treatment to teach new reinforcement contingencies more quickly and efficiently.

Several studies have demonstrated that, for some individuals, lower levels of problem behavior occur when preferred demands are presented vs. when less preferred demands are provided (Foster-Johnson et al., 1994; Vaughn & Horner, 1997). However, the ABA literature does not provide clear guidelines on how to systematically assess demand preference. Several studies have evaluated demand preference by asking students to choose between (Cole et al., 1997) or rank-order tasks (Cooper et al., 1992). One potential problem with having students choose between tasks is that students whose behavior is maintained by escape from demands may not choose to work on any tasks. Also, for very young students, or for those unable to indicate preference, asking them to choose between demands may not be very effective.

Teacher or caregiver report is one alternative to having individuals make a choice between demands in order to evaluate preference. Vaughn and Horner (1997) assessed task preference through teacher report and direct observation, and verified results by evaluating rates of problem behavior under higher preference vs. lower preference tasks. Higher rates of problem behavior did occur when tasks identified as lower preference, by teacher report, were presented. Also, when later given a choice, students generally choose the tasks previously identified as higher preference. However, subsequent studies have not been conducted evaluating the accuracy of caregiver report thus, it remains unclear whether adults or observers can accurately identify student demand preference.

Another alternative for evaluating demand preference involves providing various demands and calculating preference ratings based on student behavior (e.g., engagement). Foster-Johnson et al. (1994) systematically evaluated demand preference by presenting tasks to students, for 30 seconds each, and having observers make judgments about the degree to which students interacted with the materials, the amount of resistance when materials were removed, and whether students moved toward task materials when they were moved farther away. These judgments were used to rank-order tasks according to preference. This procedure was successful in differentiating between tasks, and students did engage in higher rates of problem behavior when subsequently presented with tasks identified as less preferred. However, having observers rank tasks based on their impressions, rather than on observable measures of behavior, is fairly subjective. Research is needed to evaluate whether tasks can be ranked according to more objective, observable criteria.

DeLeon et al. (1999) developed a duration-based stimulus preference assessment that evaluates individuals' preference for material items (e.g., kaleidoscope, massager, talking toy) based on their duration of physical contact with each item. This procedure was found to be more accurate and effective in differentiating between items and predicting their effectiveness as reinforcers than a procedure based on approach to items in a multiple-stimulus array. Aspects of this approach to assessing stimulus preference could potentially be adapted to assess preference for demands. Namely, the duration of on-task and off-task behavior with several tasks could be used to rank-order demands according to preference. No studies to date have utilized such duration measures in assessing individuals' demand preference.

Whether demand preference will influence functional analysis outcomes remains unclear. Further research is also needed on how to accurately assess demand preference. It has yet to be examined whether a duration-based demand preference assessment will be effective in accurately differentiating between preferred and nonpreferred tasks, when compared to more traditional methods such as teacher report and having students choose between tasks. Thus, the purpose of this literature review is to examine the use of functional analysis with individuals with disabilities. Research on specific components of reinforcement that may influence functional analysis outcomes will also be examined. Finally, the literature on commonly used stimulus and demand preference assessment methods will be reviewed in order to develop a rationale for the development of a duration-based demand preference assessment methodology.

Functional Analysis

Functional analysis procedures were first developed with children and adults exhibiting severe self-injurious behaviors during extended inpatient evaluations (Carr, 1977; Iwata et al., 1982/1994). According to Durand and Carr (1985), one or more of the following consequences is typically responsible for the maintenance of aberrant behavior: access to social attention, presentation of tangible reinforcers, escape from aversive situations, and sensory feedback. Although Carr (1977) originally classified these maintaining variables as either extrinsic or intrinsic reinforcement, they are more commonly categorized today as positive, negative, or automatic reinforcement (Carr & Wilder, 1997).

Both positive and negative reinforcement involve consequences that increase the occurrence of behavior in the future. However, with positive reinforcement a reinforcing

stimulus is presented contingent on behavior (e.g., attention, tangible item). For example, if a student is attempting to gain access to a peer's toy and hitting the peer results in access to the item, the likelihood of future aggression is increased because the consequence resulted in access to the desired item (i.e., positive tangible reinforcement). Similarly, if a child screams each time her mother is on the telephone and her mother discontinues the conversation and attends to the child, screaming is reinforced with social attention (positive reinforcement). Negative reinforcement involves the removal of an aversive stimulus, such as a demand or physiological discomfort (Carr & Wilder, 1997). For example, if the presence of teacher instructions is aversive to a particular student and disruptive behavior results in time-out, where no demands are presented, the likelihood of future disruptions is increased.

Engaging in some behaviors may produce reinforcing stimuli in the absence of social consequences, referred to as automatic reinforcement. Automatic reinforcement may operate under the principles of positive or negative reinforcement. For example, a child may emit inappropriate vocalizations because the resulting sounds are reinforcing and result in sensory stimulation. Similarly, if a child has a headache and head-hitting temporarily reduces the pain associated with the headache, such behavior is strengthened. However, because behavior is maintained by intrinsic rather than environmental factors, manipulations cannot be conducted to isolate the exact consequences reinforcing aberrant behavior. Thus, behavior that persists independent of environmental consequences is classified as having an automatic function.

According to Carr (1977) aberrant behavior can be maintained by any of these factors and thus must be assessed on an individual basis. He recommended a three-step

screening process to determine the factors related to the occurrence of behavior. Step 1 involves screening for biological disorders that may be responsible for aberrant behavior (e.g., otitis media may lead to head banging). Next, Carr recommended evaluating whether behavior increases under certain environmental conditions (e.g., adult attention, removal of reinforcers, presence of aversive stimuli or demands). Finally, during Step 3 behavior is assessed in the absence of environmental consequences and stimuli. If behavior occurs under these conditions, Carr explained that self-stimulation may be the source of motivation. By identifying the consequences that produce behavioral increases, one can isolate the factor(s) responsible for its maintenance. Carr (1977) also recommended the use of analogue experiments to increase understanding of the motivation of aberrant behavior. Analogue experiments involve replicating conditions of interest in the natural environment, as closely as possible, while removing extraneous factors, in order to increase experimental control. By controlling extraneous variables, and focusing on only those of interest, researchers can gather more conclusive evidence regarding which variables are maintaining aberrant behavior. Carr's (1977) work paved the way for the use of analogue assessment to determine the functions of human behavior.

Iwata et al. (1982/1994) were the first to systematically evaluate Carr's (1977) hypothesis by developing a method for experimentally assessing the factors maintaining aberrant behavior, known as functional analysis. Nine participants, between the ages of 18 months and 17 years, were selected to participate in the study. All of the children resided in the inpatient unit of a pediatric hospital and were referred for moderate to high rates of self-injurious behavior (e.g., head-hitting, self-biting, eye gouging). Participants

were exposed to four experimental conditions, during 15-minute sessions, using a random multielement design. Conditions included social disapproval, academic demand, unstructured play, and alone. During the social disapproval condition, the child was told to play alone while the therapist worked nearby; attention, in the form of a reprimand, was provided following each instance of self-injury. During the academic demand condition the therapist used a three-prompt hierarchy to direct the child to complete an educational task; a 30-second break from the task was provided contingent on self-injury. The unstructured play condition was included as a control condition in that little to no self-injury was expected to occur; it was an "enriched environment" which included an array of stimulating items, no demands, and social approval contingent on appropriate behavior. Finally, the alone condition was designed as an "impoverished environment" in that no materials or social attention were available; the child was placed in a therapy room alone.

According to Iwata et al. (1982/1994), results indicated five distinct patterns of responding, which varied both within and across participants. First, during unstructured play, all of the participants exhibited self-injury at rates either consistent with or below their overall mean. Second, four participants exhibited their highest rates of self-injury during the alone condition, indicating that external sources of reinforcement exerted less of an effect on their behavior than possible internal sources of stimulation. Third, two participants displayed higher rates of behavior during the academic demand condition, indicating that their self-injury was maintained by escape. Fourth, the social disapproval condition elicited the highest rate of behavior for one participant, indicating attention as the maintaining variable for self-injury. Finally, two participants showed an

undifferentiated pattern of responding, with high rates of behavior occurring across several conditions. According to Iwata et al., this undifferentiated pattern may be due to either the participants' inability to distinguish between conditions or the control of behavior by variables not manipulated in the study. Overall, results of Iwata et al. confirmed Carr's (1977) initial hypotheses that multiple factors can maintain self-injurious behavior, such factors are not random, and they differ on an individual basis.

The effectiveness of functional analysis in isolating the consequences maintaining aberrant behavior has been proven repeatedly in the literature, for a variety of aberrant behaviors. For example, Iwata, Pace, Dorsey, et al. (1994) summarized results from functional analyses for self-injurious behavior conducted with 152 individuals, over an 11 year period, and found that differential responding occurred in at least one condition for 145 of the participants (95%). Negative reinforcement, or escape from demands and other aversive stimuli, was the predominant function found for aberrant behavior (38% of participants compared to 26% for positive reinforcement and automatic reinforcement). Aside from self-injury, functional analyses have been successful in identifying the functions of various other topographies of challenging behavior including aggression, destruction, pica, disruption, bizarre speech, and muscle tics (Mace et al., 1991; Lennox & Miltenberger, 1989).

Although the functional analysis procedures described by Iwata et al. (1982/1994) were quickly accepted in the clinical setting, researchers were more reluctant to adopt their use in more natural settings, such as the school, due to the amount of time and training necessary for conducting such an assessment (Northup et al., 1991). However, several recent studies have demonstrated the effectiveness of functional analysis

procedures in both regular and special educational settings (Sasso et al., 1992; Northup et al., 1994; Broussard & Northup, 1995). For example, Sasso et al. (1992) demonstrated the use of functional analysis in the school setting by conducting both descriptive and experimental analyses of aberrant behavior for two children with autism, placed in self-contained classrooms, using teachers as therapists. The study included a conventional functional analysis, conducted outside of the classroom by the researchers, an A-B-C assessment conducted in the classroom by the teachers, and a functional analysis conducted in the classroom by the teachers. A-B-C assessment involves the recording of antecedents and consequences associated with each occurrence of aberrant behavior (Bijou, Peterson, & Ault, 1968). Escape from demands was found to be the function of both participants' aberrant behavior; results were consistent across all three assessments. Interventions were then designed which were successful in reducing the occurrence of aberrant behavior for both students. These findings indicate that functional analyses can be conducted effectively in the natural classroom setting.

Despite the successful application of experimental functional analyses into more natural settings, such analogue assessments continue to be omitted by schools as part of an FBA for several reasons (Stichter, 2001). Functional analyses require repeated measurement over what is often an extended period of time and thus are generally considered too time-consuming and cumbersome for school personnel to conduct. Another major concern in conducting functional analyses is the level of expertise necessary to conduct an effective assessment; typically teachers and school personnel require frequent consultation with an expert in functional analysis in order to use the technique (Stichter, 2001). Finally, teachers and parents are often concerned about the

use of functional analysis because of the ethical issue of exposing children to situations that may elicit aberrant, often dangerous, behavior. While this is a legitimate concern, most ABA researchers believe the benefits of functional analysis (e.g., fast, accurate results can lead to the development of effective interventions more quickly) far outweigh the costs (Stichter, 2001).

In an effort to reduce the amount of time required to conduct a full-scale functional analysis, Wallace and Iwata (1999) evaluated the effect of session duration on the results of functional analyses conducted with forty-six individuals exhibiting aggressive or self-injurious behavior, living in a state residential facility. The researchers found that 5-minute assessment sessions were as effective in identifying the function of behavior as more traditional 10 or 15-minute sessions. Thus, they demonstrated that efficiency could be increased by reducing the amount of time required to conduct a functional analysis, without sacrificing clarity of results.

In summary, functional analysis technology has proven effective in isolating the consequences maintaining aberrant behavior across a variety of individuals, for many distinct aberrant behaviors, across clinical and natural settings. Research on functional analysis is now aimed at increasing efficiency as well as application to more natural settings, such as the school or the home (Sasso et al., 1992; Asmus et al., 1999). Additional research is needed to further extend the application of functional analyses to the school setting, particularly with students in the general education environment, as the majority of studies have been conducted with special education populations (Sasso et al., 1992). Research that continues to demonstrate the effectiveness of functional analysis in targeting aberrant behaviors other than SIB is another area in need of further

development. Finally, recent research on functional analysis methodology has begun to evaluate more specific types of reinforcement (e.g., specific qualities of attention) or antecedents (e.g., specific types of demands) provided in a functional analysis that may influence results (Richman & Hagopian, 1999; Iwata et al., 1990).

Influences on Functional Analysis Outcomes

Recent research in functional analysis methodology has begun to focus on more detailed specification of the antecedents and consequences controlling behavior. Carr, Yarbrough, and Langdon (1997) demonstrated that the failure to identify specific stimulus variables associated with problem behavior dramatically altered functional analysis results for three adolescents diagnosed with autism and referred for aggression, self-injury, or disruptive behavior. The researchers first had trained observers conduct naturalistic observations, with an emphasis on antecedents, behaviors and consequences, of the three students for 1 to 3 months. Next, functional analyses were conducted with each participant based on procedures described by Iwata et al. (1982/1994). Finally, idiosyncratic stimulus variables, identified for each participant, during observations, were incorporated into a second functional analysis. Idiosyncratic variables were different for each participant and included the absence of preferred wristbands, the presence of puzzles in the assessment room, and the presence and inaccessibility of specific magazines. Results indicated that the function of each participant's aberrant behavior remained unclear until specific idiosyncratic variables were incorporated into the assessment. Thus, strictly adhering to functional analysis procedures described by Iwata et al. without considering specific stimulus variables that may impact a particular individual may lead to inconclusive results.

Idiosyncratic Influences on Behavior Maintained by Positive Reinforcement

Several studies have examined specific qualities of attention or tangible reinforcement, provided in a functional analysis, in an effort to more clearly understand the variables controlling aberrant behavior. Fisher et al. (1996) examined the specific form of attention maintaining the destructive behavior of a boy with autism and oppositional defiant disorder in order to determine whether the type of attention provided influences functional analysis results. The researchers conducted a traditional functional analysis, as described by Iwata et al. (1982/1994). Once attention was found to be the factor maintaining the child's aberrant behavior, they evaluated two different types of attention, verbal reprimands, which are traditionally provided in a functional analysis, and verbal statements unrelated to behavior. These conditions were conducted using a multielement design, with procedures identical to the functional analysis, with the exception of the type of attention provided. Higher rates of destructive behavior occurred during the verbal reprimand condition when compared to the neutral statement condition, suggesting that the type of attention provided in a functional analysis can influence results. The authors explain, "it is unlikely that a given client's destructive behavior is maintained by all forms of attention or by escape from all types of activities" (p. 235).

Richman and Hagopian (1999) also evaluated specific components of attention following inconclusive functional analyses for two six-year-old boys diagnosed with mental retardation and referred for self-injury and property destruction. After obtaining undifferentiated functional analysis results for both participants, the researchers turned to descriptive information, gathered prior to the analyses through parent interviews and observations, which suggested that the children's behavior was likely maintained by

access to attention. For one participant, exaggerated verbal attention (e.g., "Oh my goodness, I can't believe you did that!") was commonly provided by his mother contingent on aberrant behavior. A second, pair-wise, functional analysis was conducted for his behavior that included two phases and utilized an ABAB reversal design. One phase involved a pair-wise comparison between regular attention condition and free play; the other compared exaggerated attention to free play. Results confirmed the researchers' hypothesis in that rates of behavior were highest and showed more differentiated results when exaggerated attention was provided. For the other participant, physical attention (e.g., being picked up and held by and adult) was observed during descriptive assessments to occur frequently following aberrant behavior. A second functional analysis was conducted for his behavior utilizing a multielement design and three conditions: contingent verbal attention, contingent physical attention, and noncontingent verbal and physical attention. Rates of his destructive behavior were highest in the physical attention condition, confirming initial hypotheses. This study provides additional support for the need to occasionally consider specific aspects of functional analysis conditions when assessing the function of aberrant behavior.

Lalli and Kates (1999) manipulated specific reinforcers within the tangible and attention conditions following inconclusive functional analyses (Phase 1) for three students with developmental disabilities. Based on descriptive analyses indicating that problem behavior occurred when the children were engaged in toy play with an adult and another child, a subsequent functional analysis (Phase 2) was conducted in which another child and a preferred toy were present in both the attention and tangible conditions. In the attention condition the child had access to a toy but could receive the adult's attention

by engaging in problem behavior; in the tangible condition the child had a toy to play with but would receive access to the other child's toy contingent on problem behavior. Results for all three participants indicated that both adult attention and access to tangible items maintained problematic behavior when another child was present, thus suggesting dual attention and tangible functions. The researchers then conducted a concurrent-schedules modification to the Phase 2 functional analysis to further evaluate the function of participants' behavior. Conditions were conducted similar to Phase 2 except that now one type of aberrant behavior resulted in attention and another in access to toys. Thus, both types of reinforcement were available within one condition. This was conducted in two phases so that the behavior and reinforcement pairings could be counterbalanced (i.e., attention was provided for self-injury in one phase, toys were provided for it in the other phase). Results indicated that for two participants, aberrant behavior was primarily maintained by access to attention; for the other participant access to tangible items was found to be primary function of behavior. These results are another example of how modifications to traditional functional analysis conditions may need to be made to clearly understand the function of some individuals' behaviors.

Mueller et al. (2001) were the first to specifically evaluate whether specific components of tangible items used during a functional analysis influence assessment results. They first conducted a functional analysis for an eight-year-old child diagnosed with autism and referred for aggressive behavior. The child's aggression was found to be maintained by access to tangible items (a book). The researchers then conducted a stimulus preference assessment to evaluate the student's preference for various tangible items. Next, an antecedent analysis was conducted in which one item was restricted and

another was available noncontingently. The researchers varied the preference of restricted and available items Results indicated that restriction of high preference items, when compared to middle or low preference items, resulted in higher levels of aggression, regardless of the child's preference for available items. This study demonstrates that the degree of preference for items used during the tangible condition of a functional analysis may influence results. Because the authors did not provide consequences during the antecedent analysis (i.e., the restricted item was not provided contingent upon behavior) the influence of item preference on functional analysis results could not be examined directly.

In summary, research has shown that specific qualities of positive reinforcement provided during a functional analysis (e.g., type of attention, preference for the tangible item) may influence assessment results (Richman & Hagopian, 1999; Mueller et al., 2001). However, the majority of these studies were conducted following inconclusive functional analyses and examined idiosyncratic variables unlikely to be influential for many individuals (Richman & Hagopian, 1999; Lalli & Kates, 1999). More research is needed to experimentally investigate which variables are most likely to influence functional analysis findings in general, rather that looking at such antecedents only following inconclusive results. Mueller et al. were among the first to systematically examine specific antecedents (e.g., preference for tangible objects) that may influence functional analysis findings. However, because they did not examine preference in the context of a functional analysis it remains unclear whether preference for items provided during the analysis (e.g., tangible condition) will influence results. More research is needed to examine this question. It is important in such studies to provide consequences

for behavior during antecedent assessments in order to determine if those antecedents would in fact influence functional analysis results.

Idiosyncratic Influences on Behavior Maintained by Negative Reinforcement

In conducting functional analyses for seven children and adolescents referred for self-injurious behavior (SIB), Iwata et al. (1990) found that the type of demand presented may influence assessment results. The researchers selected educational tasks for use during the functional analyses, through teacher interviews and informal observation. For one participant however, descriptive assessment indicated that SIB was most likely to occur during medical examinations. Thus, his functional analysis included two demand conditions: academic and medical. Results of the functional analyses indicated that for all seven participants, SIB was maintained by escape from demands. However, for the one participant for whom two demand conditions had been conducted, only medical demands were found to occasion aberrant behavior. Iwata et al. also found that for another participant, more effortful, motor tasks (e.g., dressing, shoe tying) produced higher rates of SIB during the functional analysis than table tasks (e.g., sorting, pointing). Treatments were developed and implemented successfully for each participant based on the type of demands that occasioned his/her aberrant behavior. This study illustrates the importance of pinpointing which types of demands set the occasion for aberrant behavior in order to accurately identify the function of behavior. For one participant, if only educational demands had been included in the functional analysis, the function of SIB (escape from medical demands) would not have been identified.

Smith, Iwata, Goh, and Shore (1995) examined the influence on escape-maintained self-injurious behavior of several dimensions of demands including task

novelty, session duration, and rate of task presentation. Participants included nine individuals with developmental disabilities living in a public residential facility. Functional analyses were first conducted with each participant and indicated that for all nine individuals, SIB was maintained by escape from demands. Next, separate studies were conducted to examine the specific qualities of demands; 2 to 5 of the nine participants were included in each of the subsequent studies. During the first study, task novelty was assessed conducting sessions identical to the functional analysis demand condition however, following three sessions in which stable or decreasing rates of SIB occurred, a novel task was presented, and the initial task was continued in an multielement design. Results indicated that both participants engaged in higher rates of self-injury on the initial presentations of a task (when it was novel); self-injury decreased on subsequent presentations of the same task (as it became familiar). The influence of session duration was examined in a second study by conducting sessions identical to the demand condition in the functional analysis but examining trends in behavior as a function of time throughout the session. The duration of the session influenced responding for two out of five participants. Their rates of self-injury increased throughout the sessions, indicating that patterns of behavior during a functional analysis may change over time; thus longer sessions may lead to higher rates of behavior for some individuals. Finally, the influence of the rate of task presentation on SIB was evaluated by comparing two conditions: one high-rate (i.e., demands were presented every 30s) and one low-rate (i.e., demands were presented every 90s). Conditions were conducted following procedures used during the functional analysis; an A-B design was used for three participants and a multielement design was used for two. One participant exhibited

significantly more self-injury when demands were presented at higher rates; three others showed moderate but less pronounced effects related to rate of presentation. For one participant, the effect was reversed with higher levels of SIB during lower rates of task presentation, however the difference was small. These results provide additional evidence that for some individuals, specific qualities of demands may influence the rate of aberrant behavior observed within a functional analysis. As evident with these participants, which demand characteristics influence behavior differ on an individual basis; what is an aversive demand for one person may not be for another.

Research has shown that another demand quality that may influence rates of aberrant behavior for some individuals is demand preference (Foster-Johnson et al., 1994; Vaughn & Horner, 1997). For example, Vaughn and Horner (1997) evaluated the influence of both task preference and task choice on aggression and disruption for four students diagnosed with mental retardation and attending special education classes at public schools. During Phase 1 higher and lower preference tasks were identified for each student based on teacher interviews and direct observations. Next, during Phase 2 (a structural analysis), a multielement design was used to evaluate the influence of higher vs. lower preference tasks on student behavior. At the end of Phase 2, a validation of assessment was conducted in which students were asked to choose between one higher preference and one lower preference task before each session and then behavior was evaluated with the chosen task. Results indicated that tasks identified during Phase 1 as lower preference did result in higher rates of problem behavior for all participants. During the validation assessment, students almost always chose the task identified as higher preference and engaged in lower rates of problem behavior, thus validating results

of the informal preference assessment (Phase 1). Finally, during Phase 3, student choice conditions were compared to teacher choice conditions. During the choice conditions, the students were given a choice between either two higher preference tasks or two lower preference tasks to separate the effects of choice and preference. In the no-choice condition, the teacher selected the same tasks previously chosen by the student (choices were yoked). Two ABAB reversals were conducted with each participant in which choice and no-choice were alternated: one for higher preference tasks and one for lower preference tasks. Results for the lower preference tasks indicated that for two participants choice resulted in slightly lower levels of problem behavior. During the higher preference tasks, choice did not exert an effect for any of the participants; lower levels of problem behavior occurred, compared to the lower preference tasks, regardless of whether the student or teacher chose the task. Thus, this study suggests that preference for demands may influence the rate of problem behavior for some individuals, independent of choice.

In summary, several studies have shown the qualities of the demand selected for use in a functional analysis may influence the rate of aberrant behavior for some individuals, and thus impact results. Task novelty, session duration, rate of task presentation, and the type of task presented (e.g., fine vs. gross motor, medical vs. academic) have all been shown to influence escape-maintained aberrant behavior (Iwata et al., 1990: Smith et al., 1995). More research is needed to investigate additional task qualities that may influence functional analysis findings, as it is important for researchers to understand which demand features should be taken into account when selecting tasks for use in a functional analysis. One aspect of demands that has not been evaluated in the

context of a functional analysis is demand preference. Research has demonstrated that students may exhibit higher rates of problem behavior when presented with less preferred tasks, regardless of whether they are given a choice between tasks (Vaughn & Horner, 1997). Thus, an individual's preference for the demand presented in a functional analysis may potentially influence results. To date, systematic preference assessment has focused solely on preference for tangible materials and this literature typically has to be extended to demands.

Stimulus Preference Assessment

Stimulus Preference Assessment Techniques

Although the focus of this study is on the assessment of demand preference, it is important to review the major stimulus preference assessment methods used in the field of ABA, as these will be influential in the development of demand preference assessment techniques. One of the first, and still commonly used, methods for identifying reinforcer preference among individuals with developmental disabilities was developed by Pace, Ivancic, Edwards, Iwata, and Page (1985). The researchers examined approach behaviors (i.e., moving toward an object with either hand or body) to systematically evaluate preference for 16 stimuli for six individuals with profound mental retardation. The 16 stimulus items were presented singly to each participant; if the individual approached the item, 5 seconds access was provided. If no approach occurred, the individual was prompted to sample the item and another trial was initiated. If no approach occurred a second time, the item was removed. Each of the 16 items was presented a total of 10 times, with order counterbalanced. Once the items were differentiated according to preference, a validation assessment was conducted in which preferred and nonpreferred

items were provided as consequences for specific target behaviors (e.g., reach, touch, look); this was compared to a baseline in which no reinforcers were provided. Results indicated that items identified as preferred, using the approach method, were more successful than the nonpreferred items in increasing the rate of the target behavior for all six participants. These results suggested that a systematic preference assessment procedure, based on measures of approach, can be useful in differentiating between preferred and nonpreferred items for individuals with profound disabilities.

Fisher et al. (1992) suggested that a concurrent operants paradigm, in which individuals have to make a choice between two reinforcers, may be a useful extension of the Pace method, as it more closely approximates natural situations where individuals choose among stimuli by differentially responding. Therefore, Fisher et al. (1992) compared the Pace et al. (1985) method, described above, to a forced-choice preference assessment procedure. They evaluated preference for 16 stimuli for four individuals with moderate to profound mental retardation. The forced-choice procedure involved presenting stimuli in pairs; each stimulus was paired with every other stimulus for a total of 120 pairs. Similar to the Pace method, approach to one of the stimuli resulted in 5 seconds access. If no approach occurred, the individual was prompted to sample both items and then asked to choose again. The items were removed if no choice was made the second time and another trial began. Approach to both items was blocked. Both preference assessment methods identified the same 9 stimuli as highly preferred. However, the Pace method also identified 27 additional items as highly preferred. The researchers then conducted a validation phase in which they compared the effectiveness of reinforcers identified as preferred by both methods at least 80% of the time to those

identified as preferred only by the Pace method. Reinforcer effectiveness was measured using the duration of time participants spent standing or sitting in the area where the reinforcer was located; two types of reinforcers were concurrently available (one set were chosen by both methods and one set were chosen by the Pace method). Only those stimuli identified by both methods served as potent reinforcers in the validation phase, indicating that the Pace method may lead to the over-identification of items as preferred.

Although forced-choice preference assessment methods have been effective in identifying reinforcers, in some cases such methods lead to ambiguous results because an individual either prefers too few or too many of the items presented (DeLeon et al., 1999). Multiple- or single-item approach-based procedures can also be useful in differentiating preference (Pace et al., 1985; DeLeon & Iwata, 1996). However, in some cases such methods may overestimate preference for reinforcers (Fisher et al., 1996). Both procedures also typically only allow for brief access to the selected items (e.g., 5 to 30 seconds), which may not be appropriate for evaluating preference for activities, such as tasks.

DeLeon et al. (1999) evaluated a duration-based preference assessment approach, following an inconclusive multiple-stimulus approach-based assessment, for four individuals with mental retardation. The researchers examined preference for 7 items by placing stimuli individually on a table in front of the participant for 2 minutes and measuring the amount of time the individual maintained physical contact with the item. The percentage of time participants manipulated each item was used to determine preference. The researchers examined reinforcer effectiveness for items identified as preferred and nonpreferred for two of the participants, by providing reinforcement

contingent on task compliance (e.g., hair brushing) and comparing responses to baseline (no reinforcement). The duration-based preference assessment provided more differentiated results than the previous approach-based preference assessment. The validation assessment indicated that the items with which the participants were engaged longer during the preference assessment led to higher target response rates compared to the items they spent less time engaged with. This duration-based preference assessment method could potentially be adapted to evaluate preference for tasks, as individuals who are motivated to escape demands may initially avoid choosing or approaching any tasks presented to them. Such a method would also allow individuals more access to each activity, as only allowing 5 or 30 seconds may not be adequate time for them to engage in some tasks.

Hagopian et al. (2001) compared the duration-based preference assessment developed by DeLeon et al. (1999) to a forced-choice assessment, based on procedures described by Fisher et al. (1992), with four participants referred to an impatient unit for severe behavior problems. Phase 1 consisted of a stimulus preference assessment for each participant using the two procedures. A list of reinforcers was identified for each participant based on caregiver report. Results of the assessments indicated that although the forced-choice procedure resulted in somewhat greater variability among items (percentage of approach varied more than the duration of engagement), the duration-based procedure required an average of 23% less time for administration than the forced-choice procedure. During Phase 2, a validation assessment was conducted to determine if the preference rankings of the duration-based assessment were predictive of relative reinforcer effectiveness. For each participant, the preference hierarchy produced by the

duration-based assessment in Phase 1 was used to assign items to one of three categories: high-, middle-, and low-preference. Participants were then trained to independently engage in the target behavior (remaining in a square area). During each session, three concurrent options were available. For example, remaining in one square would result in no consequence (control), another square would result in a high-preference stimulus, and a third square would result in access to a middle-preference stimulus. During each session, one option was always a control and the other two varied between high-, low-, and middle-preference so all three comparisons could be evaluated. For all 4 participants results supported the predictive validity of the preference hierarchy produced by the duration-based assessment. Participants engaged in higher rates of target responses with high-preference stimuli compared to middle- or low-preference stimuli and with middle-preference stimuli compared to low-preference stimuli. The authors describe several advantages of the duration-based procedure developed by DeLeon (1999) including its potential use with individuals with disabilities who may have difficulty choosing among items, its shorter administration time, and its appropriateness for activities that may be more difficult to present using a forced-choice method (e.g., singing, dancing).

Dyer (1987) developed a unique systematic stimulus preference assessment in an effort to identify reinforcers that would be effective in suppressing stereotypic behavior, during task performance, for six students with autism. The effectiveness of reinforcers identified during the systematic assessment was compared to the utility of common reinforcers (e.g., food, praise) typically used in other contexts of the participants' lives, using a multielement design. The systematic assessment was conducted each day, before tasks were introduced. Ten stimulus items were evaluated each day, each of which was

reported by caregivers to be enjoyable for the student. The therapist presented each item individually by demonstrating to the student how it could be manipulated. Each object was then rated, by an observer, according to the following criteria: the student manipulated the object for at least 15 seconds without prompting, the student resisted removal of the item, the student reached for the object when it was moved a short distance away, and the student displayed positive affect when engaged with the item. Those objects rated as having the highest numbers of the above criteria were considered preferred and were presented during the subsequent analysis. Results indicated that all three students exhibited lower rates of stereotypy and higher rates of responding when the systematically assessed reinforcers were used, compared to the usual reinforcers. Although some of the measures used in this study were somewhat subjective (e.g., ratings of positive affect) and the "usual reinforcers" were chosen based on caregiver report, these results indicated that effective reinforcers can be identified based on student engagement and other behaviors, rather than explicit choice or approach.

In summary, research has demonstrated the effectiveness of several systematic assessment methods in identifying preferred stimuli for individuals with developmental disabilities. Measures based on participant choice between two or multiple items or approach to one or more items have been used successfully to identify effective reinforcers (Pace et al., 1985; Fisher et al., 1992; DeLeon & Iwata, 1996). However, in cases in which too many or two few preferred items are presented; ambiguous findings may result (DeLeon et al., 1999). For individuals engaging in aberrant behavior that may be maintained by escape from demands, asking them to choose between two tasks or waiting for them to approach a demand may not be the most efficient way to assess

demand preference, as they may attempt to avoid demands altogether. Dyer (1987) and DeLeon et al. (1999) developed systematic preference assessment methods that may be more effective in differentiating between a group of nonpreferred items or activities, such as tasks. Both of their assessments involve presenting items singly and measuring the degree of (Dyer) or duration of (DeLeon) student engagement with materials. So, the individual never has to select an item; preference is based on the extent to which they interact appropriately with an item when it is placed in front of them. Such procedures could potentially be adapted to examine demand preference. For example, demands could be presented to an individual one at a time and the duration he or she spends appropriately engaged in each task could be used to differentiate preference. However, this hypothesis has yet to be examined.

Comparison to Caregiver Report

Although the field of ABA emphasizes direct observation, it is often common to ask care providers to assist in the identification of preferred stimuli for use as potential reinforcers rather than conducting direct observations or a systematic preference assessment. Several studies have been conducted comparing some of the systematic stimulus preference assessment methods, described above, to caregiver opinion. Green et al. (1988) evaluated preference among 12 stimuli for seven individuals with profound disabilities, living in a residential facility, using the Pace et al. (1985) method. Preferred items were identified for 5 of the 7 participants. Next, staff members were asked to report on the individuals' preference for the 12 items using a Likert-type scale. At least 5 staff members completed a survey for each student. The preference ratings for each item were averaged across rating scales and the 12 items were ranked according to caregiver

opinion of student preference. Spearman's rank correlation coefficient was used to compare staff rankings to the systematic assessment results. Results indicated that, for all 7 students, there were no statistically significant correlations between staff ratings and student approach-behaviors. Thus, the staff did not correctly identify preferred items, when compared to a systematic preference assessment. The effectiveness of four sets of reinforcers were then compared in a validation assessment: those rated as highly preferred using both methods, those rated as high preference according to one method and low preference according to the other (thus there were two sets), and those stimuli ranked as low preference according to both methods. These sets of stimuli were evaluated as reinforcers for task compliance (e.g., switch-pressing) using a reversal design in which no reinforcement was available during baseline. Results indicated that items identified as preferred via the systematic preference assessment typically functioned as effective reinforcers for all 5 participants. However, items identified through staff opinion were not effective as reinforcers unless they had also been selected as preferred during the systematic assessment. Thus, caregiver report was not effective, above and beyond a more systematic preference assessment method, in predicting which reinforcers would facilitate skill development for persons with disabilities.

Green, Reid, Canipe, and Gardner (1991) replicated the first two phases of the Green et al. (1988) study (systematic preference assessment and staff rating) with six more participants and found similar results; for four of the six students there were no significant correlations between student approach-behavior and caregiver opinion. Thus, caregiver report does not appear to be a reliable method for determining individuals' preference for reinforcers.

Fisher, Piazza, Bowman, and Amari (1996) compared caregiver report to results of a systematic forced-choice preference assessment for six children and adolescents referred to an inpatient unit for destructive behavior. Caregivers in this study were the child's primary guardian, who was typically the child's mother, and in one case a grandmother. During Phase 1, caregivers were asked to rank order a standard set of 16 stimuli (used in the Fisher et al. 1992 and Pace et al. 1985 investigations). Next, the Reinforcer Assessment for Individuals with Severe Disabilities (RAISD), a structured interview developed for this study by the authors, was conducted in which caregivers generated a list of reinforcers and situations in which their child prefers those items. They then rank-ordered the list of items according to preference. Following caregiver interviews, two forced-choice preference assessments were conducted with each child, using procedures described by Fisher et al. (1992); one with each set of stimuli ranked by caregivers. Rank-order correlation coefficients were calculated to compare the results of the assessments and caregiver rankings; results indicated no significant correlations for the standard set of stimuli. However, there were significant correlations between assessment results and parent ranking for the caregiver-generated set. During Phase 2, an ABAB reversal design was used evaluate the effectiveness of reinforcers identified in each of the forced-choice assessments by monitoring in-seat/in-square behavior. The stimuli identified as preferred from the list generated by caregivers were chosen more often, and resulted in higher rates of target behavior for all participants. These results suggest that caregiver report may be more accurate in predicting student preference when caregivers are permitted to generate a unique list of stimuli, rather than ranking a standard set. The authors suggest that accuracy may be influenced by the degree to

which caregivers are familiar with the items they are asked to rank. They also report that although caregiver rankings were statistically significant with assessment results for the generated set, they most likely would not be clinically significant (i.e., correlations were not strong). Thus, as reported in other studies, caregiver report alone may be inadequate to clearly identify preferred reinforcers for students with disabilities.

In summary, research on the accuracy of caregiver report, in identifying preferred stimuli for children, has demonstrated low to no correlation with systematic assessment results (Green et al., 1988; Fisher et al., 1996). Systematic assessments have shown to be more accurate than caregiver report in identifying effective reinforcers (Green et al., 1988).

Demand Preference Assessment

Although researchers in the field of ABA typically select one of the previously mentioned methods to assess client preference for reinforcers for use during assessment (e.g., free play, attention, and tangible conditions of a functional analysis) or treatment, procedures used to assess demand preference vary more from study to study. Despite the availability of several approaches for evaluating demand preference, such procedures are not widely used as a way to select demands for use during the escape condition of a functional analysis (Mithaug & Hanawalt, 1978; Foster-Johnson et al., 1994). In addition, the limited amount of research in this area has precluded the replication and extension of the few available methods for assessing demand preference (Foster-Johnson et al., 1994). Several different procedures for evaluating task preference are reviewed in the following section.

Demand Preference Assessment Techniques

Mithaug and Hanawalt (1978) were the first to develop a systematic method for assessing demand preference among individuals with severe disabilities, unable to indicate preference via a more traditional vocational interest inventory. The researchers evaluated preference, among three adults with profound mental retardation, for six occupational workshop tasks the participants completed on a daily basis. Each of the tasks was paired with every other task for a total of 15 trials. During each trial, the two tasks were placed in front of the participant and they were told to pick one and place it on their worktable. The individual was then provided 7 minutes to work on the selected task, followed by a break before the next trial was initiated. The researchers did not collect data on engagement during the 7 minutes access to each chosen task. Tasks selected at least 75% of the time were considered preferred; those chosen 25% or less were nonpreferred. Following the preference assessment, the researchers evaluated the validity of the results by presenting either a high or low preference task with a neutral task and asking participants to choose between the two. Generally, moderately preferred tasks were selected more often when paired with a low preference demand and less often when placed next to a high preference demand, thus validating results of the preference assessment. This early study was important in demonstrating that task preference can be systematically assessed in individuals with severe disabilities. However, the researchers did not assess the degree to which individuals were engaged with each selected task during the preference assessment. If such data had been collected, it could have been compared to overall preference ratings to determine if individuals' choices corresponded

to their actual time spent on-task. It remains unclear whether such measures (i.e., choice of task and time spent on-task) are correlated.

Parsons, Reid, Reynolds, and Bumgarner (1990) set out to replicate the results of Mithaug and Hanawalt (1978) as well as to examine the influence of choosing tasks vs. working on assigned tasks of varying levels of preference on task performance. Five work tasks, all steps in an assembly line, were evaluated for four adults with severe mental retardation and reported behavior problems. The researchers conducted the preference assessment by following procedures described by Mithaug and Hanawalt with the exception that clients were provided 10 minutes to work on selected tasks prior to the next trial. Next, the influence of task choice and preference on work performance was evaluated using a multielement design. Three conditions were included: assigned high preference task, assigned low preference task, and choice between the two. On-task behavior for all four participants was much higher when they were provided a high preference or chosen task compared to a low preference task (91% and 90%, respectively vs. 46%). When given a choice between tasks, individuals typically chose the task previously identified as high preference. Results suggested that assigning preferred tasks may be as effective, in increasing on-task behavior, as providing individuals with a choice among tasks. It seems that the preference of the demand, rather than choice, has more of an impact on task performance.

Cole, Davenport, Bambara, & Ager (1997) replicated the procedure developed by Mithaug and Hanawalt (1978), previously used with adults in workshop settings, in the classroom setting with three students, referred for disruptive, stereotypic, and aggressive behavior, attending a laboratory school for children with emotional and behavioral

disorders. After conducting the preference assessment, the researchers replicated the multielement design used by Parsons et al. (1990) to assess the influence of choice and task preference on performance. For two participants, task engagement was slightly higher during chosen or preferred tasks compared to nonpreferred tasks. For the other participant, rates of engagement were similar across conditions. Changes in preference occurred from pre-assessment to post-assessment for preferred tasks; nonpreferred tasks remained stable. These results indicated that for some individuals, working on preferred or chosen tasks may not lead to significant differences in performance. They also suggested that preference for tasks may change over time.

Cooper et al. (1992) used a slightly different approach to evaluate student task preference for 10 children with mild intellectual disabilities referred to an outpatient clinic for conduct problems. The researchers presented three randomly selected academic tasks and asked students to choose which of the three they would most prefer and least prefer to do in school. Both difficult (instructional level) and easy (mastery level) tasks were included so that level of demand could be separated from task preference. Eight triad presentations were conducted and the tasks were rank ordered according to preference. During Study 1, a brief, 90 minute, multielement structural analysis was conducted with 8 participants to evaluate rates of behavior under conditions of high vs. low task difficulty, preference, and adult attention. Three of the children responded best to less demanding tasks, one to more preferred tasks, and two to parent attention. Treatment packages were recommended for each student based on these results. Study 2 was conducted in a special education classroom for 2 participants and utilized a multiple baseline design, across academic subjects, combined with a multielement design in which

conditions of varying task demand, preference, choice, and adult attention were alternated. Results indicated that one student performed best when given a choice among tasks or when presented with preferred tasks. The other student exhibited better performance when preferred, demanding tasks were presented along with intermittent teacher attention. This study is another demonstration of assessing task preference by asking students to choose among an array of tasks, however in this case they were asked to choose which tasks they most and least preferred. Results also illustrated that task preference, choice among tasks, and task difficulty each has the potential to influence student behavior under demand conditions.

Dunlap et al. (1994) examined the separate influence of choice and task preference on adaptive and disruptive behavior for three students in self-contained classrooms at a public elementary school, referred for behavioral problems. During Study 1, reversal designs were conducted in the classroom to evaluate two of the children's behavior in choice vs. no-choice conditions. During the choice condition, students were provided with a menu of 6 to 10 academic tasks to choose from; students were permitted to change tasks at any point during the session. During the no-choice condition, assignments were selected by the classroom teacher and written on the board. For both participants, task engagement was higher and rates of disruptive behavior were lower during the choice condition. In Study 2, with the third participant, procedures were the same except during the second no-choice condition, the tasks presented were yoked to the last choice condition in an effort to compare the influence of choice vs. task preference. Tasks were considered preferred if the student had chosen them in a previous session; demand preference was not separately assessed. Results indicated that

engagement was higher and disruptive behavior was lower during both choice conditions compared to both no-choice conditions (including the one yoked with previously chosen tasks). These results indicated that whether individuals have a choice in which task they work on may influence both adaptive and problem behavior, above and beyond the effect of task preference alone. However, because the researchers did not conduct a systematic demand preference assessment, it is unclear whether they were really comparing preference to choice or previous choice to current choice.

The studies described in this section each evaluated demand preference based on having individuals explicitly choose between tasks. However, some individuals are either unable or unwilling to choose between demands, especially in cases in which behavior may be maintained by escape or avoidance of such demands (Hagopian et al., 2001). Several researchers have attempted to assess demand or activity preference using methods other than explicit choice. Koegel, Dyer, and Bell (1987) assessed autistic children's preference for play activities by measuring the amount of time they engaged in various activities during naturalistic observations. Activities initiated and maintained by the children for at least 15 seconds were considered child-preferred; those activities not maintained for at least 15 seconds were considered arbitrary. The researchers identified 5 of each type of activity and conducted a reversal design to evaluate social avoidance behavior under child-preferred vs. arbitrary activities. Results indicated that participants were more responsive and engaged in lower levels of social avoidance during child-preferred activities. Although this study did not examine task preference, it demonstrated that activities can be differentiated according to preference by methods other than explicit choice (e.g., duration of engagement).

Foster-Johnson et al. (1994) modified the stimulus preference assessment developed by Dyer (1987), which involved differentiating preference based on student interaction with objects, to assess demand preference for three students with moderate to severe intellectual disabilities. Five academic tasks, all in a maintenance phase of learning, were selected for each student. Preference assessment sessions were conducted over 3 days, with 5 trials conducted each day, one for each task. During each trial, the task was first presented for 1 minute; during which time the instructor modeled and assisted the child in completing the task. Next, the student was given 30 seconds to interact with the task materials before they were removed. Three of the criteria described by Dyer were used to determine preference for each task: student resistance to removal of task materials, student initiation toward materials when they were moved away, and student engagement (i.e., interaction and manipulation) with the materials. Following each trial, observers assigned each task a numeric value for each of the criteria ranging from 0 (behavior indicating low preference) to 2 (behavior indicating high preference). Across all three criteria, a task could receive a total score between 0 and 6; the daily preference ratings were averaged across all three days for a final preference ranking. Following identification of preferred and nonpreferred tasks, a reversal design was used to evaluate student behavior during tasks of varying preference. All three students exhibited higher levels of problem behavior and lower rates of appropriate behavior when nonpreferred tasks were presented. This study provides evidence that preference for demands can be evaluated effectively based on measures other than explicit choice. However, observers in this study assigned scores somewhat subjectively, based on their impressions rather than discrete data (e.g., duration of engagement, rate of aberrant

behavior). Further research is needed in this area to determine if using objective behavioral data, such as duration or rate, can be used to similarly rank demands according to preference. In addition, determination of final preference ranking was based on combined averages, rather than looking at stable trends in demand preference rankings. It is unclear if averages, rather than preference consistency, is a more appropriate measure of actual preference.

In summary, the majority of research available on the assessment of demand preference has typically used procedures similar to those developed by Mithaug and Hanawalt (1978) in which individuals are asked to make a choice between two or more tasks (Parsons et al., 1990; Cole et al., 1997; Cooper et al., 1992). These studies demonstrate the effectiveness of choice-based techniques in identifying preferred and nonpreferred tasks for many students with disabilities. However, some individuals with disabilities may not be capable or willing to choose between demands, which necessitates the development of alternative techniques (Hagopian et al., 2001). Foster-Johnson et al. (1994) illustrated the effectiveness of evaluating demand preference using procedures based on student engagement and other task-related behavior, rather than choice. However, they used somewhat subjective observer impressions to differentiate tasks, rather than objective measures of student behavior. Also, measures such as manipulation of or movement toward task materials seem to reflect preference for task materials rather than the task itself. Additional research is needed to examine such alternative methods for assessing demand preference, using more objective data and measures more relevant to preference for demands, rather than demand materials (e.g., time on- or off-task rather

than engaged) and looking at stability of preference over time rather than at calculated averages.

Comparison to Caregiver Report

With so few studies having been conducted on the systematic assessment of demand preference, it is understandable that little to no research has compared task preference assessment results to caregiver or teacher report. The only study to date, which has attempted to address this question, was that of Vaughn and Horner (1997), described in detail previously. Vaughn and Horner identified higher preference and lower preference tasks via teacher interviews and task nominations. Direct observations were then used to determine whether problem behavior occurred during tasks identified by teachers as lower preference. Tasks were selected based on teacher report and direct observation. The researchers then compared results to a validation phase in which students were asked to choose between one higher preference and one lower preference task. Students almost always chose the demand previously identified as higher preference, and engaged in lower rates of problem behavior when such demands were presented. However, because tasks were identified using both direct observations and teacher interviews, it is unclear which information was more influential in selecting higher and lower preference tasks. Although this study suggested that teachers can provide accurate information about student preference for demands, more research is needed to support this initial finding.

Statement of the Problem

This literature review demonstrates the need for further research in several areas. First, research continues to be needed that extends the application of functional analyses

to more natural settings, such as the school, particularly with students in general education classrooms. With recent federal legislation mandating that students with disabilities be educated, to the maximum extent possible, alongside their nondisabled peers, schools are now in need of effective techniques, such as functional analysis, to help eliminate aberrant behaviors that may interfere with such inclusion. The use of functional analysis in targeting aberrant behaviors other than SIB is another area worthy of continued investigation, as the majority of early studies using the technique were conducted on populations referred for SIB (Iwata, Pace, Dorsey et al., 1994).

Additional research is also needed to evaluate demand preference assessment procedures that rely on measures other than explicit choice, as individuals with developmental disabilities may be unable or unwilling to make a choice between demands. Preference assessment procedures developed by Foster-Johnson et al. (1994) and DeLeon et al. (1999) provide evidence that the way individuals interact with items or activities (e.g., engagement) can effectively be used to differentiate preference among stimuli or tasks. However, the measures used in these studies seem to reflect preference for task materials, rather than for the demand itself (Foster-Johnson et al., 1994). For example, behaviors such as holding a pencil or touching a book are not clear indicators that an individual prefers the tasks of writing or reading; he or she may simply prefer the texture of those objects. Using task-related behaviors such as on- and off-task may lead to a more systematic assessment of preference for tasks, rather than materials. It also remains unclear whether demand preference assessment procedures, using measures other than explicit choice, will correlate with results from an assessment based on choice. If

results are equivalent across assessment methods, it may provide evidence that either can be selected for use with a client without compromising the outcome.

Although research has been conducted comparing caregiver/teacher report to results of systematic stimulus preference assessments, little to no research has been conducted examining systematic demand preference assessments. Thus, it remains unclear whether teachers can accurately identify which tasks are most preferred or least preferred by a particular student. Finally, research has shown that several qualities of the demand selected for manipulation in a functional analysis may influence the rate of behavior observed (Smith et al., 1995). However, one aspect of demands that has not been evaluated in the context of a functional analysis is demand preference. Although several studies have shown that presenting students with less preferred demands leads to higher rates of behavior, it remains unclear whether task preference will influence functional analysis outcomes (Vaughn & Horner, 1997).

Purpose of this Study

This study is intended to address the following questions:

1. Are teachers' reports of students' task preferences in agreement with observed student task preference based on an experimental duration-based demand preference assessment?

2. Are teachers' reports of students' task preferences in agreement with observed student task preference based on an experimental forced-choice demand preference assessment?

3. Is a duration-based demand preference assessment approach, combining measures of duration of on- and off-task and rates of problem behavior, successful in identifying more preferred and less preferred tasks?

4. Are the results of a duration-based demand preference assessment in agreement with the results of a forced-choice demand preference assessment?

5. Are there differences in functional analysis outcomes (e.g., rate of aberrant behavior) when the most preferred vs. the least preferred tasks, as identified via the experimental preference assessments, are presented during the escape condition?

CHAPTER 3
METHODS

Overview

The purpose of this study was to (a) assess whether a duration-based demand preference assessment was successful in differentiating between most preferred and least preferred tasks, (b) evaluate the agreement between results of a duration-based demand preference assessment and a forced-choice demand preference assessment, (c) compare teachers' reports of students' task preferences to results of a duration-based demand preference assessment, (d) compare teachers' reports of students' task preferences to results of a forced-choice demand preference assessment, and (e) examine the antecedent influence of most preferred vs. least preferred tasks on functional analysis outcomes.

This study was an extension of the Autism Inclusion Project (AIP), a grant funded by the United States Department of Education. The AIP was a three-year study that examined the use of applied behavioral analysis techniques in reducing the aberrant behaviors of children with Autism Spectrum Disorders (ASD) included in regular education classrooms.

Participants

Three students already enrolled in the AIP were selected for participation in this study. Students met the following criteria for participation in the project: (a) they were between the ages of five and twelve, (b) they had a diagnosis that fell under the category of Autism Spectrum Disorders, and (c) they were identified by either their parents or

teacher as exhibiting problem behaviors at home or school, respectively. It was also required that all participants were included in regular education for at least 50% of the school day. No additional criteria were required for inclusion in this study. A brief description of each participant follows.

Rachel was a six-year-old Caucasian female diagnosed with autism and enrolled in an inclusive kindergarten classroom. She was included in regular education 97% of the school day. Rachel received speech and language services outside of the classroom for 30 minutes, twice a week. Her intellectual functioning was in the high average range, with a General Intellectual Ability of 120, according to the Woodcock-Johnson Tests of Cognitive Abilities – Third Edition (WJ-III). Target behaviors for Rachel included disruption and off-task.

Charlie was an eight-year-old Caucasian male diagnosed with ASD, Cystic Fibrosis, Attention Deficit Hyperactivity Disorder (ADHD), Obsessive Compulsive Disorder (OCD), and Asocial Disorder. Charlie was enrolled in 2nd grade and included in the regular education classroom for 79% of the school day. He spent the rest of the school day in special education receiving services for both gifted students and those diagnosed with specific learning disabilities. Charlie's intellectual functioning was in the very superior range, with a Full Scale IQ of 131, as measured by the Wechsler Intelligence Scale for Children – Third Edition (WISC-III). Primary behaviors of concern for Charlie included noncompliance, disruption, and aggression.

Wayne was a seven-year-old Caucasian male diagnosed with autism and enrolled in an inclusive kindergarten classroom. He was included in regular education for 94% of the school day. Wayne received services for speech and language and occupational

therapy outside of the classroom. Wayne received a Composite score of 77 on the Stanford-Binet – Fourth Edition (SB-IV), which placed in him in the below average range compared to same aged peers. However, only the abstract and visual reasoning sections of the test were administered so Wayne's score was only an estimate. Wayne's primary behaviors of concern included aggression, disruption, and self-injury.

This study was conducted at school for each participant. This study's procedures were included within the AIP consent form signed by the parents and teacher of each student upon their entry into the project. However, separate approval of the consent form, for use in this study, was obtained from the University of Florida Institutional Review Board.

Therapists, Settings, Materials, and Tasks

Therapists and Settings

This study involved four phases: (a) a descriptive demand assessment, (b) a duration-based experimental demand preference assessment, (c) a forced-choice experimental demand preference assessment, and (d) an experimental functional analysis incorporating the most preferred and least preferred tasks identified during the two demand preference assessments. Each phase was conducted in the school setting for each participant. Phase 1 was conducted in each student's general education classroom and Phases 2 through 4 were conducted in a vacant room at the student's school. There was no therapist assigned during Phase 1, as it involved naturalistic classroom observations and an interview with the teacher.

A graduate research assistant with training in applied behavior analysis served as the primary therapist for Phases 2 through 4. During all phases, a standard VHS-C

camcorder on a tripod was present and used to videotape all sessions for subsequent data collection. In addition to the therapist, a second graduate research assistant was present at each session in order to operate the video camera.

Materials

Aside from the tasks used during Phases 2 through 4, which will be discussed in a later section, the materials used with each participant were those selected for use during the functional analysis. These were preferred or neutral items and activities such as toys, games, and puzzles. Materials were specific to each participant and identified through direct observation and an interview with each student's teacher (Phase 1). Materials for Rachel included puzzles, a Walkman with a tape of Disney songs, Legos, a Leap Frog talking farm, and an electronic See-and-Say phonics game. Charlie's materials consisted of puzzles, books, paper and pencils for drawing, a Connect Four game, and K-Nex building materials. Materials used with Wayne included puppets, books with pop-out pieces, a wind-up plastic duck, a ladybug massager, and an electronic See-and-Say phonics game.

A stimulus preference assessment, based on procedures developed by Roane, Vollmer, Ringdhal, and Marcus (1998) was used to evaluate preference for these tangible items, for each participant, prior to each session of the functional analysis. Items were presented in a multiple-stimulus array and the duration of engagement with each stimulus was measured using real-time data collection sheets developed by Rapp, Carr, Miltenberger, Dozier, and Kellum (2001). The items with the highest duration of engagement were considered the most preferred stimuli for that day.

Tasks

Similar to materials, tasks were specific to each participant and identified during Phase 1. Information regarding the specific tasks used with each student will be presented later. Six academic tasks were selected for use during Phases 2 and 3. The tasks identified as most preferred and least preferred during the experimental demand preference assessments (Phases 2 & 3) were used during the functional analysis (Phase 4). Details of the task selection process are explained in the procedures section.

Response Definitions

Aberrant Behavior

The frequency of the following aberrant behaviors was scored during Phases 2 through 4. For Phase 4, the frequency of each aberrant behavior was converted to rate per minute for data analysis.

Rachel. Rachel's aberrant behavior was divided into two topographies: disruption and off-task. Disruption included (a) noncompliance, defined as verbally refusing to complete a task; (b) screaming, whining, or crying, which were defined as making high pitched vocal sounds; (c) destruction, which was defined as throwing objects; and (d) tantrums, which were defined as at least two of the following behaviors in combination: screaming, crying, whining, stomping feet, knees to floor, running around room. Rachel's off-task behavior was defined as not facing task materials or the instructor, or not participating in the instructional activity. At least 10 seconds had to elapse following a request for Rachel to complete a task before she was considered off-task.

Charlie. Charlie's aberrant behavior consisted of three topographies: noncompliance, disruption, and aggression. Noncompliance was defined as the failure to

complete an instruction, or begin to follow an instruction within 5 seconds after a request was given. Disruption included (a) verbal talk that was threatening, loud, or out of context; (b) making noises by pounding or tapping objects on desk or walls; (c) laying body across desk, chair, or table; (d) throwing objects (not directed at another person) or pulling objects away from another person; (e) dropping to ground and remaining there; and (f) attempting to leave an area or room or actually leaving an area or room. Aggression consisted of (a) hitting others with a closed fist or open hand; (b) pinching others, defined as closing two fingers around another person's skin; (c) kicking others, defined as swinging one or both legs back, while standing or seated, and attempting to bring them into contact with another person; (d) pulling hair, defined as reaching out and grasping another person's hair; and (e) throwing objects at others.

Wayne. Wayne's aberrant behaviors were divided into three topographies: aggression, disruption, and self-injury. Aggression consisted of (a) hitting others with a closed fist or open hand; (b) pushing others, defined as pressing hands or body into another person; (c) kicking, defined as swinging one or both legs back, while standing or seated, and attempting to bring them into contact with another person; and (d) tripping others, defined as swinging one or both legs between someone else's and attempting to trip them. Disruption was defined as (a) tantrums, which included at least 2 of the following behaviors: yelling, whining, crying, jumping up and down, and throwing body on the floor; (b) noncompliance, defined as the failure to complete an instruction, or begin to follow an instruction, within 5 seconds after a request had been given; (c) elopement, defined as leaving the area of instruction or attempting to leave the area of instruction; and (d) destruction, defined as throwing items on the floor. Finally, Wayne's

self-injury consisted of head hitting, defined as picking up objects and banging them into his head.

Durational Task Related Behaviors

The following child behaviors were scored, for each participant, during Phases 2 3. During Phase 3 (forced-choice preference assessment), data on child behaviors were not used to rank the tasks, however, these data were collected for purposes of interobserver agreement.

On-task. Defined as the duration the student was appropriately engaged in the task, as modeled by the therapist. This included the amount of time spent reading, writing, completing problems etc. This did not include touching or holding materials if the student was not actually working on the task as instructed.

Off-task. Defined as the duration the student was either not looking at the task, inappropriately manipulating task materials, or not working on the task as directed (e.g., spinning pencil, looking away, head down on table, tracing instead of writing).

Non-Durational Task Related Behaviors

Percentage of items correct/incorrect. During Phases 2 through 4, the number of items completed was recorded for each task, following each session. The percentage correct/incorrect was calculated by dividing the number of items correct/incorrect by the total number completed.

Task compliance. Defined as following, or beginning to follow, a directive within 5 seconds after it had been given. The frequency of task compliance was scored during Phase 4.

Observation System and Interobserver Agreement

Observation System

During all four phases all sessions and observations were videotaped using a standard VHS-C camcorder on a tripod. During Phase 1, five to ten hours of video were reviewed and a list of all tasks presented was complied. During Phases 2 through 4, data were collected on Hewlett-Packard Palmtop computers using the Multi-Option Observation System for Experimental Studies, or MOOSES (Tapp, Wehby, & Ellis, 1995). This program can be used to record the frequency and the duration of target behaviors.

During Phases 2 through 4 aberrant behavior was scored as a frequency. For example, each time a behavior started (e.g., student began engaging in a tantrum) the key for tantrum was pressed. In order for another tantrum to be scored the student would have to stop engaging in that behavior and then begin again. The duration behaviors (on-task and off-task), scored during Phases 2 and 3, were continuous measures. At all times during a session the student was considered either on-task or off-task, as these behaviors were mutually exclusive. For example, if the student immediately began working on the task, the on-task key was pressed; it then remained on until the student's behavior changed to off-task or the session ended. The computers signaled the end of each session with built-in timers. Consistency of scoring was maintained for each participant; all sessions for each student were scored either live or from the videotapes, but not using both methods. The principal investigator served as the primary data collector for all participants.

Following each day's sessions, the Palmtop computers were connected to a desktop computer, equipped with MOOSES, and frequency and duration reports were printed out for each behavior. These reports were used to obtain the duration of task related behaviors and the frequency of aberrant behavior (Phases 2 and 3) or the rate per minute of each aberrant behavior (Phase 4).

Interobserver Agreement

Interobserver agreement was not collected during Phase 1, as it involved compiling information from teacher interview and direct observation to determine which tasks should be assessed. During Phases 2 through 4, a graduate research assistant served as a second observer and scored at least 30% of the assessment sessions to obtain interobserver agreement. The second observer was trained to 80% reliability with the first observer, on each of the codes, using the direct observation videotapes for each participant, before data collection began. Regardless of whether the primary observer collected data live or using the videotapes, the second observer used the videotapes to score sessions in order to reduce the number of people present during each session. Interobserver agreement was calculated separately for each code by MOOSES, which calculates the number of agreements divided by the number of agreements plus disagreements. For each condition, the interobserver agreement on each code was averaged to provide the overall agreement on that condition. The agreement on all conditions during each phase was then averaged to provide the interobserver agreement for each particular phase.

During Phase 2 (duration-based preference assessment) a second observer coded 33% of the conditions for Rachel, 30% for Charlie, and 31% for Wayne. Interobserver

agreement averaged 95% for Rachel's behaviors (range 85% to 100%), 97% for Charlie's behaviors (range 90% to 100%), and 95% for Wayne's behaviors (range 88% to 99%). During Phase 3 (forced-choice preference assessment), a second observer collected data on 33% of conditions for Rachel, 44% for Charlie, and 33% for Wayne. Agreement averaged 95% for Rachel (range 81% to 100%), 99% for Charlie (range 95% to 100%), and 96% (range 94% to 99%) for Wayne. Finally, during Phase 4 (functional analysis) interobserver agreement was collected on 33% of the conditions for Rachel, 32% for Charlie, and 48% for Wayne. Agreement averaged 97% for Rachel (range 83% to 100%), 97% for Charlie (range 82% to 100%), and 90% for Wayne (range 75% to 100%).

Design and Analysis

Design

No design was used in Phase 1. During Phases 2 and 3, (experimental demand preference assessments) tasks or pairs of tasks were presented in random order to avoid possible sequence effects. Phases 2 and 4 were conducted using a multielement design in which the six tasks (Phase 2) or conditions (Phase 4) were alternated (Iwata et al., 1982/1994). Random order was determined on a daily basis by placing the name of each condition or task in a cup and pulling out one at a time.

Analysis

Data during Phases 2 and 4 were analyzed on a daily basis using single-subject-design graphs in order to make decisions about which tasks (Phase 2) or conditions (Phase 4) to conduct during subsequent sessions or if data collection should end. During Phase 2, graphs were used to visually display daily task preference rankings, plotted from

1 to 6. During Phase 4, graphs indicated the rate per minute of target behaviors during each 5-minute condition. The rate per minute of each aberrant behavior was calculated by dividing the total frequency of each behavior for each five-minute condition by five. Separate functional analysis graphs were constructed for each behavior in order to evaluate the function of each behavior separately. The condition under which each aberrant behavior occurred most often was considered the function of that behavior.

During Phase 4, separate graphs, based on the percent of directives followed by compliance vs. aberrant behavior were constructed for each participant to allow for comparison of the different escape conditions of the functional analysis. For all three participants, the different tasks used in each condition (most preferred and least preferred) varied slightly in the amount of time required to complete each item and thus the number of directives provided by the therapist during the condition. Because the occurrence of some aberrant behaviors (e.g., noncompliance) was dependent on the number of directives presented (e.g., a student can only be noncompliant following a directive) differences in the rates of those aberrant behaviors were influenced by characteristics of each specific task. Thus, by calculating the percentage of directives followed by compliance vs. aberrant behavior during each escape condition the tasks were analyzed on an equal scale. Following each condition, the number of times the student complied to a directive was divided by the total number of directives in order to determine the percentage of compliance. The percentage of compliance was then subtracted from 100 in order to calculate the percentage of directives followed by aberrant behavior. This method was used rather than dividing the number of aberrant

behaviors by the number of directives as some aberrant behaviors occurred in the absence of a directive.

Line graphs were used to provide a graphic depiction of the differences in behavior between various conditions or across tasks. Graphs were examined for stability (variability), according to procedures described by Gast and Tawney (1984). A three-point rule was utilized in making decisions regarding whether to begin a new session (Phase 2) or condition (Phase 4) or to terminate data collection. Data collection for each phase was terminated when the last 3 data points of the task (Phase 2) or condition (Phase 4) were stable (i.e., 2 points formed a trend and a third data point confirmed the direction of the trend).

Procedures

Phase One: Descriptive Demand Assessment

During the descriptive demand assessment six tasks were identified for use in the subsequent preference assessments (Phases 2 and 3) and teachers were asked to rank those tasks according to student preference. Tasks were identified for each student through a combination of direct observation and indirect assessment. Information regarding the specific tasks selected for each student is contained in the following sections.

Direct Observation

Five to ten hours of direct observation were conducted at school for each participant. Observations were conducted across several days, during a variety of times in order to ensure a representative sampling of various tasks and activities. Students were only observed in the regular education setting, per requirements for the AIP.

Observations were videotaped for later scoring. The primary investigator viewed the videotapes and made a list of every task (academic and nonacademic) presented during direct observations (see Appendix A).

Indirect Assessment

A primary, regular education teacher was identified for each participant. Teachers were interviewed using the Functional Assessment Interview (FAI) in order to identify problem behaviors, events that set the occasion for problem behavior, and events that served to maintain it (O'Neill et al., 1997). Specific sections of the FAI provided informants the opportunity to suggest tasks, which were more or less likely to produce problem behavior. A graduate research assistant, with specific training on the FAI interviewed each teacher. Following completion of the interview, teachers were asked to list activities (either academic or non-academic) that the student preferred and did not prefer.

Identification of Tasks

Of the tasks identified during the direct (list of tasks observed) and indirect assessments (results of FAI, teacher list of activities), six were selected for teacher ranking and manipulation during the experimental preference assessments. First, a list of all tasks reported by the teacher or observed on the videotapes was generated. These demands were then reduced to a list of academic demands (e.g., spelling, reading, writing, math, drawing). Nonacademic demands (e.g., watching a video, listening to a story read by the teacher) were not included. That list was then reduced to six tasks based on the following considerations: (a) difficulty of task, (b) ease of adaptation for multiple presentations, (c) response topography, (d) presentation modality, and (e)

common use in the classroom (see Appendix A for complete lists of tasks considered for each participant).

Tasks were selected so that they were similar with respect to task difficulty; only tasks with which the student achieved 80% accuracy independently were selected for use in the subsequent preference assessments (Phases 2 and 3). Tasks that were observed or reported to be more difficult (student cannot obtain 80% accuracy independently) were removed from the list. All six tasks also had to be adaptable to multiple presentations (i.e., a number of different items must be available for presentation) and must have been commonly used in the classroom. Therefore, tasks that were infrequently presented, during observations or based on teacher report, and tasks that were not adaptable to repeated presentation were eliminated from the list. Finally, six tasks were selected from the remaining list that varied in presentation modality (e.g., whether items were presented verbally, on paper, or through gestures) and response topography (e.g., whether tasks required written, verbal, or gestural responses) to avoid dominance of one particular modality for presentation or response. For example, not all tasks selected for each student were presented visually or required written responses. For a description of the tasks selected for each student, see Appendix B.

Teacher Ranking

Following the identification of six tasks and prior to the start of Phase 2, each student's preference for the selected tasks was assessed through teacher rankings. Teachers were presented with a list of the six tasks selected and asked to rank them in order of student preference from most preferred (with a ranking of 1) to least preferred (with a ranking of 6). Teachers were given an example of each task (e.g., a worksheet) to

ensure that they understood the differences between tasks. An example teacher ranking form is presented in Appendix C. After the completion of Phase 4, teachers were asked to rank the tasks a second time. Once all of the preference assessments were completed, both sets of teacher rankings and results from the experimental demand preference assessments were compared to determine whether they were in agreement concerning the most and least preferred tasks, as well as the ranking of the other four tasks.

Phase Two: Duration-Based Demand Preference Assessment

The six tasks selected for each student were first systematically evaluated by combining components of two procedures in the literature (DeLeon et al., 1999; Foster-Johnson et al., 1994). Duration-based preference assessment sessions were conducted across several days, with each task presented once during each session (Foster-Johnson et al., 1994). Thus, each session involved six conditions (i.e., tasks). The number of assessment sessions varied depending on the stability of the data for each child, but a minimum of five sessions was conducted with each participant. Thus, each task was presented at least five times.

Tasks were first introduced, for one-minute each, during a practice session (Foster-Johnson et al., 1994). During practice, the therapist first reviewed an example item. The student was then given one minute to practice the task. During each one-minute practice session, the therapist used a three-prompt sequence to direct the student to attempt an item (e.g., verbal prompt, model, guidance). First, the therapist asked the student to attempt an item. If after 5 seconds the student did not attempt the item, the therapist modeled how to complete the task (e.g., "copy the definition like this"). If the student still did not attempt the task 5 seconds after the model, guidance was provided. If

time permitted following student completion of one item, the therapist continued to prompt the student to complete items until the full minute elapsed.

During the one-minute practice conditions, reinforcement was held constant across tasks (Foster-Johnson et al., 1994). Verbal praise (e.g., "good job") was provided for completion or attempted completion of the task, including instances of guided compliance. Accuracy data was collected during practice so that task difficulty could be compared (see Appendix D for accuracy data for each student). Only tasks with similar difficulty levels (e.g., the student scored above 80% on all tasks) were used for Phases 2 through 4. If 80% accuracy had not been obtained during practice, a different task would have been selected and the same procedures repeated.

During the subsequent preference assessment sessions, each task was presented once during each session. One to two sessions were conducted per day. The task materials were placed on the table, directly in front of the student. During each task, students were given two minutes to interact freely with the materials. The therapist began by telling the student "Here are some worksheets, you can work on them if you like. You don't have to do it if you don't want to." The therapist then sat next to the child and acted as if engaged in a different activity (e.g., reading) unless she was presenting items (e.g., spelling words). If the student attempted to converse with the therapist or requested assistance, the therapist briefly acknowledged the request, explained that she was busy, and told the student he/she should work on his/her own. No assistance or reinforcement was provided during assessment sessions. At the completion of two minutes, the task was removed and the next task was presented in the same fashion until the session was completed. During all preference assessment sessions,

minor problem behaviors were ignored. Sessions would have been ended in the event of a behavioral escalation that had the potential to cause harm to the individual or therapist. However, this did not occur with any of the participants.

Following each assessment session, tasks were rank ordered, according to preference, based on measures of on-task, off-task, and aberrant behavior. The measures recorded by the primary data collector were used to rank order tasks. On- and off-task were scored as duration measures, and ranged from 0 to 2 minutes during each condition. Aberrant behavior was scored as a frequency.

For each of the three criteria (on-task, off-task, and aberrant), a score ranging from 0 to 2 was assigned, with 2 indicating behavior indicative of high preference (e.g., high duration of time on-task, low duration of time off-task, or low frequency of aberrant behavior) and 0 indicative of low preference (e.g., low duration of time on-task, high duration of time off-task, high frequency of aberrant behavior). These rankings were relative rather than based on observer impressions; the tasks were compared to one another during the ranking process. For example, the 2 tasks, out of 6, with the longest duration of time on-task received a 2 for that criterion, the next two received a 1 and the two tasks with the lowest duration of on-task behavior received a 0. The same process was used to assign scores for off-task and aberrant behavior, however, for these criteria a lower duration or frequency received a higher score (e.g., lower amount of time off-task or less aberrant behavior receive a higher preference rating). Each task could have therefore received as many as 6 points and as few as 0.

During scoring, if several tasks had the same total duration on-task, off-task or frequency of aberrant behavior, then they received the same score. So, several scores of

2, 1, or 0 may have been assigned for a particular criterion. For example, if for three particular tasks, the student was on-task a total of two minutes, each task received a score of 2 for on-task. Depending on the total duration on-task for the other three tasks, the two closest to one another received the same score (either 0 or 1 depending on their duration relative to the other tasks) and one remaining task received the other score. For example, if two of the remaining tasks both had a lower duration of time on-task, relative to the other tasks, they both received a 0 and the remaining task, with a more moderate duration of time on-task, received a score of 1. Again, scores were assigned based on the tasks relative to one another, rather than based on pre-specified criteria.

Once scores were assigned for each criterion, they were added together for a final score ranging from 0 to 6 (as 6 total points were available). These total scores were used to rank tasks from most preferred (ranking of 1) to least preferred (ranking of 6). The task with the highest total score received a ranking of 1, the next highest was ranked 2 etc. During the daily ranking of tasks, if several tasks had the same total score, they were differentiated based on the duration of time on-task. The task with the higher duration of on-task behavior received the higher ranking (more preferred) and so on. In the event that the tasks were identical in the duration of time on-task as well, they received the same ranking that day. The rest of the tasks were then ranked according to their total score and whether it was closer to being most preferred (closer to 6), least preferred (0), or moderately preferred (3 or 4). Thus, the rankings reflected preference rather than always preceding in numerical order (e.g., there may have been two tasks tied with a ranking of 1 but no task ranked 3 on a particular day). The following table is an example, of one day of Wayne's data, to illustrate how tasks were ranked each day.

Table 3-1: Wayne's Data and Task Rankings for Day 2

Rankings by Day		Day 2							
		Duration	Duration	Freq.		Scores			
Task	Name	On-task	Off-task	Aberrant	On-task	Off-task	Aberrant	Total	Ranking
1	Put Away	23	70	12	0	0	0	0	6
2	Tracing	74	34	2	1	1	2	4	3
3	Pictures	55	24	3	1	1	1	3	4
4	Cutting	107	0	1	2	2	2	6	1
5	Counting	7	100	7	0	0	1	1	5
6	Puzzles	102	0	11	2	2	0	4	2

Visual analysis was used to evaluate fluctuations in preference across sessions. Assessment sessions were continued until there was stability in the most and least preferred tasks. For a task to be identified as most or least preferred, it had to have the highest or lowest average daily ranking, respectively. The task must have also ranked as one of the two most/least preferred tasks for at least three consecutive sessions (stability). Once the most and least preferred tasks were identified, the rest were rank-ordered according to their average daily preference rankings.

Phase Three: Forced-Choice Demand Preference Assessment

Following completion of the duration-based demand preference assessment, and after at least one week had elapsed to avoid overlap between assessments, a forced-choice demand preference assessment was conducted combining procedures used by Mithaug and Hanawalt (1978) and Fisher et al. (1992). The forced-choice preference assessment was conducted in one session, on one day. A minimum of fifteen trials were presented, with each of the six tasks paired once with every other task. Thus, each task was presented at least 5 times. However, in the event that two tasks were selected the same number of times, additional trials were conducted, with those tasks, to differentiate

preference. Random selection of pairs of tasks was conducted prior to the preference assessment; the order of pairs selected was recorded and followed during the assessment.

During each trial, the student was seated at a table and the two tasks were placed in front of him or her, at an equal distance. Position of the tasks (i.e., on the left or the right) was counterbalanced so that tasks were presented equally on each side. Once the tasks were presented, the student was told to "Pick one." Once the student chose a task either by touching it, pointing to it, or saying the name of the task, the other task was removed and the student was given 30 seconds access to the task. If the selected task required that the therapist present items to the student, the therapist presented items for 30 seconds at the same pace used in the prior preference assessment. If the student attempted to converse with the therapist or requested assistance, the therapist briefly acknowledged the request, explained that she was busy, and told the student he/she should work on his/her own. No assistance or reinforcement was provided during assessment sessions.

The tasks were rank-ordered according to preference following the 15 trials by counting the number of times each task was chosen (out of a possible 5 times). The task chosen the most times was ranked most preferred (i.e., ranking of 1) and so on. If two tasks were chosen the same number of times additional trials were conducted for those tasks until preference was clearly differentiated.

Comparison of Preference Assessment Results

Once the six tasks were rank-ordered according to both experimental assessments (Phases 2 and 3), the rankings were compared to both sets of teacher rankings, and to one another. Final rankings of each assessment were compared to determine whether teacher

rankings were in agreement with the results of the duration-based and forced-choice preference assessments and thus assess whether teachers would accurately predict which tasks students most preferred (with student behavior used as the objective indicator of task preference). The final rankings of the two experimental demand preference assessments were also compared to examine whether they were in agreement regarding the most and least preferred tasks, as well as the ranking of the other four demands. Finally, the two sets of teacher rankings were compared to determine whether teacher rankings of students' demand preference remained consistent over time.

Phase Four: Functional Analysis Incorporating Most Preferred/Least Preferred Tasks

A functional analysis was conducted at school for each participant with the manipulation of consequences contingent on the occurrence of problem behavior. Procedures were similar to Iwata et al. (1982/1994) with the modification of the demand condition. This phase was conducted across a minimum of five to seven sessions, approximately one hour each. Approximately four five-minute conditions were conducted during each session. A therapist with training and experience in functional analysis conducted the sessions in a therapy room at school. A multielement design was used during the functional analysis, with the six conditions alternated to avoid sequence effects. The following six conditions were included in this phase:

Free play. This condition served as a control in that all potential reinforcers were present noncontingent on the student's behavior, and thus very little aberrant behavior was anticipated (Iwata et al., 1982/1994). The child was provided access to preferred items while the therapist provided frequent social attention. No task demands were presented and problem behaviors were ignored.

Attention. During this condition the child was instructed to play alone. Toys were provided and the therapist was present but pretended to be occupied in another activity. The therapist provided negative social attention to the child contingent on the occurrence of problem behavior. All appropriate behavior was ignored.

Tangible. In this condition, a preferred item, previously identified via a multiple-stimulus preference assessment based on procedures described by Roane et al. (1998), was visible but in the possession of the therapist. The therapist interacted with the item and provided attention to the child but no task demands were presented. The child only received access to the item contingent on inappropriate behavior. Following the occurrence of aberrant behavior, the item was provided for 15 seconds, and then removed until the occurrence of additional problem behaviors. Appropriate behaviors were ignored.

Ignore. This condition was included to test whether behavior was maintained by automatic reinforcement (e.g., sensory stimulation). The child was left alone, without toys or materials. The therapist was present in the room, but did not interact with the student. All behaviors were ignored.

Least preferred escape. The least preferred task, according to the experimental demand preference assessments, was chosen for use in this condition. If the results of Phases 2 and 3 were not consistent and two different tasks were identified as least preferred, both were incorporated into the functional analysis (thus, in some cases there were two least preferred escape conditions). During this condition the therapist prompted the child to complete the task. If the child did not attempt compliance within five seconds or engaged in other inappropriate behaviors, a 15-second break was provided and

the task materials were removed. Following each break, the therapist presented another prompt. Compliance was praised briefly (e.g., "good job") and then another prompt was delivered.

Most preferred escape. This condition utilized procedures identical to the nonpreferred escape condition except for the task selected. In this condition, the most preferred task, according to the experimental demand preference assessments was chosen for manipulation. If the assessments in Phases 2 and 3 identified two different tasks as most preferred, both tasks were included in the functional analysis, in two separate most preferred escape conditions.

Visual inspection techniques were used to determine during which condition(s) behavior was most problematic. The functional analysis was continued until a clear function (at least 3 stable or increasing data points) was determined for each behavior. Special attention was paid to whether differences in rate of problem behavior and percentage of directives followed by compliance occurred in the most preferred vs. the least preferred demand condition, which would suggest that task preference influenced functional analysis outcomes.

CHAPTER 4
RESULTS

Overview

The purpose of this investigation was to (a) evaluate the effectiveness of a duration-based demand preference assessment in identifying most and least preferred tasks for three students with ASD, (b) compare the results of a duration-based demand preference assessment to those of a forced-choice demand preference assessment, (c) examine the agreement between teachers' rankings of students' task preferences to results of a duration-based demand preference assessment, (d) examine the agreement between teachers' rankings of students' demand preferences to results of a forced-choice demand preference assessment, and (e) evaluate the influence of task preference on functional analysis outcomes.

These questions were addressed via four phases of assessment. During Phase 1, a list of common classroom tasks was identified for each student based on direct observation and teacher interview. The initial list of tasks was then narrowed down, according to several criteria, to six for manipulation during the experimental preference assessments. All 3 teachers were asked to rank those tasks, according to student preference, at the end of Phase 1. Two of the teachers (Charlie's and Wayne's) were also asked to rank student preference for the tasks a second time, at the end of the Phase 4 (functional analysis). During Phase 2, preference for the six tasks was evaluated using a duration-based demand preference assessment. Data during this phase were evaluated

using a combination of visual analysis and comparison of mean rankings. During Phase 3, students' preference for the six demands was assessed using a forced-choice preference assessment. In this phase, tasks were ranked based on the number of times chosen. Finally, during Phase 4, a functional analysis, incorporating both most and least preferred tasks in the demand condition, was conducted to identify the reinforcers maintaining aberrant behavior for each participant. Data from Phase 4 were analyzed using visual analysis.

Phase One: Descriptive Demand Assessment Results

The descriptive demand assessment consisted of identifying six tasks for each participant, to be used in the subsequent analyses (Phases 2-3) as well as obtaining teacher rankings of students' preference for each of the six tasks. The results of Phase 1 are presented separately for each participant.

Rachel

The tasks identified for Rachel via direct observation and teacher interview are listed in Appendix A. During direct observation, Rachel was observed engaging in 13 different tasks and activities. Teacher interview identified six of the same 13 tasks, as well as 4 additional tasks (free writing, copying sentences, reading, and math). The initial list of activities was then narrowed down to 10 academic tasks. Of these academic tasks, six were selected, based on criteria described in the previous chapter. The six tasks selected for use with Rachel during Phases 2 and 3, along with a brief description of how each was presented, are included in Appendix B. Following the identification of Rachel's six tasks, her teacher was given an example of each task and asked to rank them

according to Rachel's preference. Results of the first teacher ranking, in order from most preferred to least preferred were as follows: drawing, copying, reading, fill-in, spelling, and math. Second teacher rankings were not obtained for Rachel following Phase 4, as it was completed after the school year had ended.

Charlie

Tasks and activities identified for Charlie during direct and indirect assessment are listed in Appendix A. Charlie was observed to engage in 11 tasks and activities during classroom observations. Nine demands were identified for Charlie via teacher interview, 3 which were in addition to the tasks observed (copying written work, defining words, and math). The initial list of activities identified for Charlie was narrowed down to 10 academic tasks. These tasks were then reduced to the six described in Appendix B.

Charlie's teacher initially ranked the tasks, in order from most preferred to least preferred, as follows: drawing, spelling, reading, math, copying definitions, and writing. Following Phase 4, approximately 6 weeks after the first teacher ranking, Charlie's teacher was asked to rank his task preference a second time. Results of the second teacher ranking, in order from most preferred to least preferred, were as follows: reading, drawing, spelling, math, writing, and copying definitions. Thus, teacher rankings were not consistent across time.

Wayne

Tasks identified for Wayne during direct observation and teacher interview are included in Appendix A. Wayne was observed engaging in 14 tasks and activities in the classroom, 10 of which were also identified during teacher interview. One additional

activity, group circle time, was not observed in class but was mentioned during teacher interview. Eleven of these 15 activities were identified as academic tasks. These were then narrowed down to six academic tasks, listed in Appendix B, for manipulation during the experimental demand preference assessments.

Wayne's teacher initially ranked the six tasks, from most preferred to least preferred as follows: puzzles, cutting out pictures, putting away objects, picture identification, counting, and tracing letters. Subsequent to the functional analysis (Phase 4), approximately 2 months later, she was asked to rank his preference for the tasks again. During the second teacher ranking, the tasks were ranked, in order from most preferred to least preferred, as follows: puzzles, picture identification, cutting out pictures, counting, tracing, and putting away objects. As with Charlie, teacher rankings did not remain consistent over time.

Phase Two: Duration-Based Demand Preference Assessment Results

During Phase 2, preference for the six tasks, selected for each participant during the descriptive assessment, was evaluated. During each session, each task was presented to each participant for two minutes. Daily preference rankings were calculated for each task based on the duration of time students spent on- and off-task as well as the frequency of aberrant behavior. Rankings were graphed daily and visual analysis was used to examine trends in preference. Data collection ended with each participant when at least five sessions had been conducted and the most and least preferred tasks were identified. Criteria for identifying the most/least preferred task included (a) having the highest/lowest average daily ranking and (b) a ranking as one of the two most/least

preferred tasks for at least three consecutive sessions. Results of Phase 2 are presented separately for each participant.

Rachel

Nine sessions were conducted with Rachel using the following tasks: drawing, copying, reading, fill-in, spelling, and math. The results of Rachel's duration-based demand preference assessment are presented in Figure 4-1. Rankings range from 1 (most preferred) to 6 (least preferred). As depicted by Figure 4-1, Rachel's task preference was variable during the first several sessions. Reading appeared most preferred during the first 5 sessions. However, a least preferred task was not evident at that point therefore data collection was continued. Preference for reading fluctuated over the next several sessions and drawing emerged as more preferred. Following session 9, spelling was identified as least preferred (ranked as one of the two least preferred tasks for sessions 7-9) and drawing was identified as most preferred (ranked as one of the two most preferred tasks for sessions 7-9). The final task rankings, in order from most preferred to least preferred based on average daily ranking were as follows: drawing (M = 1.9), math (M = 2.9), reading (M = 3), copying (M = 3.1), fill-in (M = 4), and spelling (M = 4.6).

Charlie

During Phase 2, five preference assessment sessions were conducted with Charlie. The following six tasks were evaluated: reading, drawing, copying definitions, spelling, math, and writing. Results of Charlie's duration-based demand preference assessment are displayed in Figure 4-2. Drawing was Charlie's most preferred task; it received a ranking as one of the two most preferred tasks for 4 out of the 5 sessions. Copying

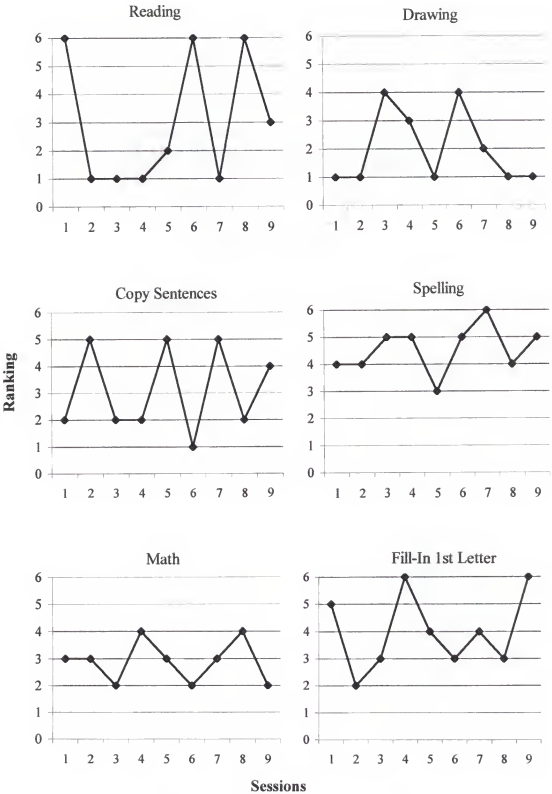

Figure 4-1: Daily task rankings for Rachel

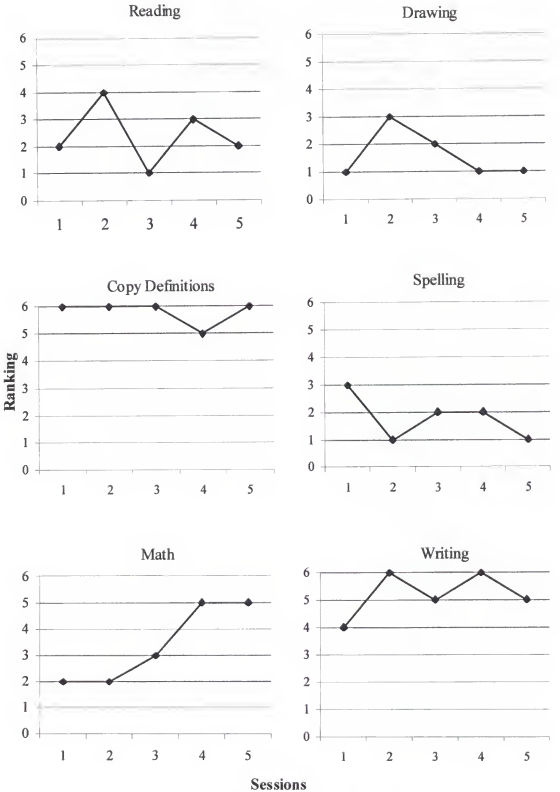

Figure 4-2: Daily task rankings for Charlie

definitions was identified as Charlie's least preferred task; it was ranked as one of the two least preferred tasks for all 5 sessions. The average preference rankings for each task, from the most preferred to the least preferred, were as follows: drawing (M = 1.6), spelling (M = 1.8), reading (M = 2.4), math (M = 3.4), writing (M = 5.2), and copying (M = 5.8).

Wayne

Six preference assessment sessions were conducted with Wayne using the following tasks: putting away objects, cutting out pictures, tracing letters, counting objects, identifying pictures, and assembling puzzles. Results are presented in Figure 4-3. Cutting out pictures emerged as Wayne's most preferred task; it was ranked as one of the two most preferred tasks for 5 of the 6 sessions. Counting was ranked one of the two least preferred tasks for all 6 sessions and was identified as Wayne's least preferred task. Average daily preference rankings for the six tasks, in order of preference were as follows: cutting (M = 1.5), picture identification (M = 2.5), puzzles (M = 2.7), tracing (M = 4.3), put away (M = 4.8), and counting (M = 5.2).

Phase Three: Forced-Choice Demand Preference Assessment Results

Following the duration-based demand preference assessment, task preference was evaluated via a forced-choice preference assessment. Phase 3 was conducted in one session with each participant. Each of the six tasks was paired once with every other task for a total of 15 trials. Once the students chose a task, they were given 30 seconds to engage in it prior to the next trial. Each task was rank-ordered based on the number of times it was chosen. In the event that two or more tasks had the same ranking following the 15 trials, additional trials were conducted with those tasks until preference was clearly

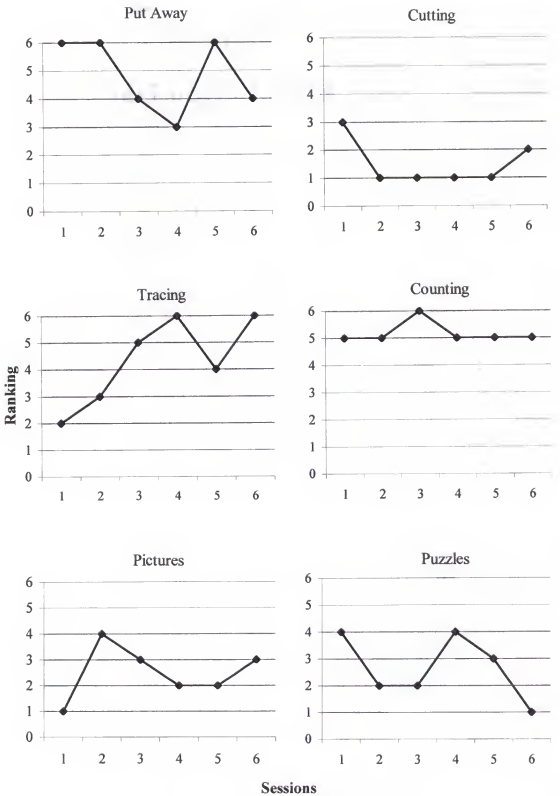

Figure 4-3: Daily task rankings for Wayne

differentiated. Results of the forced-choice demand preference assessment are presented separately for each participant.

Rachel

Fifteen forced-choice trials were conducted with Rachel using the same six tasks evaluated during Phase 2: drawing, copying, reading, fill-in, spelling, and math. Based on Rachel's choices, the tasks were ranked, in order of most preferred to least preferred, as follows: drawing, math, fill-in, reading, copying, spelling. Although the rankings obtained during Phase 2 differed for several of the demands, the same tasks were identified by both assessments as most and least preferred (drawing and spelling, respectively).

Charlie

During Phase 3, 18 forced-choice trials were conducted with Charlie. As in the duration-based demand preference assessment, the following six tasks were evaluated: reading, drawing, copying definitions, spelling, math, and writing. Following the first 15 trials, three of the tasks had the same ranking (writing, copying definitions, and spelling). Therefore, 3 additional trials were conducted to differentiate preference for these tasks. Results of the forced-choice preference assessment for Charlie indicated that his order of preference for the tasks, from most preferred to least preferred, was as follows: drawing, reading, math, writing, copying definitions, spelling. Results of Phase 2 identified the same task as most preferred (drawing) but differed significantly with regards to Charlie's least preferred task.

Wayne

Eighteen trials were conducted with Wayne during Phase 3 using the following six tasks: putting away objects, cutting out pictures, tracing letters, counting objects, identifying pictures, and assembling puzzles. As with Charlie, 3 additional trials were conducted after the initial 15 to differentiate preference for 3 tasks initially chosen the same number of times (assembling puzzles, tracing letters, and counting objects). Upon completion of the 18 forced-choice trials, the tasks were ranked, in order of Wayne's most to least preferred, as follows: cutting out pictures, tracing letters, counting objects, assembling puzzles, putting away objects, identifying pictures. As with Charlie, results of Phase 2 identified the same most preferred task (cutting) but differed with regards to Wayne's least preferred task. Counting was his least preferred task according to results of Phase 2, while identifying pictures was identified as least preferred during Phase 3.

Comparison and Summary of Demand Preference Assessment Results

Upon completion of the three demand preference assessments (Phases 1-3), and after obtaining final teacher rankings, results were evaluated by comparing final assessment rankings across the three phases. Rankings were examined for consistency, particularly with regard to the tasks identified as most and least preferred. Results are presented separately for each participant.

Rachel

Results of Rachel's demand preference assessments are presented in Table 4-1. Results of all three assessments identified the same task, drawing, as most preferred. The two experimental demand preference assessments identified spelling as Rachel's least preferred task. Rachel's teacher ranked math as her least preferred task, which was

ranked as the second most preferred activity via the two experimental methods. However, her teacher did rank spelling as Rachel's second least preferred task (ranking of 5), which is fairly consistent with results of the other two assessments. Teacher ranking and the duration-based demand preference assessment both identified reading as the third most preferred task. Results of all three assessments were inconsistent regarding the rankings for fill-in and copying sentences.

Table 4-1: Comparison of Demand Preference Assessment Results for Rachel

Task	Duration PA Ranking	Forced Choice PA Ranking	Initial Teacher Ranking	Final Teacher Ranking
Spelling	**6**	**6**	5	N/A
Fill-In	5	3	4	N/A
Copying	4	5	2	N/A
Reading	3	4	3	N/A
Math	2	2	**6**	N/A
Drawing	**1**	**1**	**1**	N/A

Charlie

Demand preference assessment results for Charlie are presented in Table 4-2. Results of both experimental preference assessments and initial teacher rankings were consistent in identifying drawing as Charlie's most preferred task. During final teacher rankings, reading was identified as the most preferred task, with drawing ranked second most preferred. Reading was given more moderate rankings (3 or 2) by the other three methods. There was greater disagreement, in assessment results, regarding Charlie's least preferred task. Copying definitions was identified as Charlie's least preferred task by the duration-based demand preference assessment and final teacher ranking. However, spelling was ranked least preferred during the forced-choice assessment which is contradictory to results of the duration-based assessment and initial teacher rankings

both identifying spelling as more preferred (ranking of 2). Writing was initially identified by Charlie's teacher as least preferred, which is fairly consistent with its ranking as one of the three least preferred tasks by the other assessments. Results of all four assessments were consistent with regards to math being more moderately preferred (ranked 3 or 4).

Table 4-2: Comparison of Demand Preference Assessment Results for Charlie

Task	Duration PA Ranking	Forced Choice PA Ranking	Initial Teacher Ranking	Final Teacher Ranking
Copying	**6**	5	5	**6**
Writing	5	4	**6**	5
Math	4	3	4	4
Reading	3	2	3	**1**
Spelling	2	**6**	2	3
Drawing	**1**	**1**	**1**	2

Wayne

Results of Wayne's demand preference assessments are presented in Table 4-3. Cutting out pictures was identified as Wayne's most preferred task by both experimental preference assessments and as the second most preferred task by initial teacher rankings. Puzzles were ranked most preferred according to both sets of teacher rankings and as a more moderately preferred task (ranking of 3) via both experimental assessments. There was more disagreement among the 4 methods regarding the least preferred task. The tasks identified as least preferred by each assessment were as follows: tracing by initial teacher rankings, putting objects away by final teacher rankings, counting by the duration-based preference assessment, and picture identification by the forced-choice assessment. There was not much consistency in rankings across methods with the

exception of putting objects away, which was identified as one of the two least preferred tasks by 3 of the 4 assessments.

In summary, results of the demand preference assessments for all 3 participants were more consistent regarding the students' most preferred, rather than their least preferred tasks. Also, teacher rankings did not remain stable across time for any of the participants.

Table 4-3: Comparison of Demand Preference Assessment Results for Wayne

Task	Duration PA Ranking	Forced Choice PA Ranking	Initial Teacher Ranking	Final Teacher Ranking
Counting	6	3	5	4
Put Away	5	5	3	6
Tracing	4	2	6	5
Pictures	2	6	4	2
Puzzles	3	4	1	1
Cutting	1	1	2	3

Phase Four: Functional Analysis Results

Functional analyses were conducted with each participant incorporating the tasks identified as most and least preferred, via the two experimental preference assessments, in the escape condition. Results of both experimental assessments were not in agreement regarding the least preferred tasks for Charlie and Wayne. Therefore, two separate least preferred escape conditions were conducted with both students. Results of the functional analysis are presented separately for each participant. Data were graphically displayed using two different methods for each student. First, graphs were created for each aberrant behavior displaying the rate of that behavior per minute under functional analysis conditions. Next, graphs were constructed for the escape conditions, displaying the percentage of directives followed by compliance and aberrant behavior. These graphs

were used to more clearly evaluate differences in behavior across the escape conditions while removing the influence of specific task characteristics such as the number of items or directives presented per minute.

Rachel

Six functional analysis conditions were conducted with Rachel: attention, free play, tangible, ignore, most preferred escape (drawing), and least preferred escape (spelling). The results of Rachel's functional analysis are presented in Figure 4-4. Data on each behavior were graphed separately. Off-task is displayed in the top panel and disruptions are displayed in the bottom panel. Rachel was off-task only twice throughout the analysis, although both times occurred during the least preferred task. Due to Rachel's low rates of off-task behavior during the functional analysis, the factors maintaining her behavior were not able to be determined.

The highest rate of disruptions occurred in the tangible condition (M = 2.4/min), followed by the least preferred escape condition (M = 1/min). Lower rates of disruptions occurred in the ignore condition (M = 0.1/min), most preferred escape condition (M = 0.02/min), attention condition (M = 0/min), and free play condition (M = 0/min). Visual analysis indicated that Rachel's disruptive behavior was most likely maintained by both access to tangible items and escape from less preferred demands (spelling).

In order to more clearly examine Rachel's behavior during the escape conditions, the percentage of directives followed by compliance and aberrant behavior were also graphically displayed and are presented in Figure 4-5. The top panel displays the percentage of directives followed by aberrant behavior (data on both off-task and disruptions were combined). Rachel engaged in aberrant behavior more often

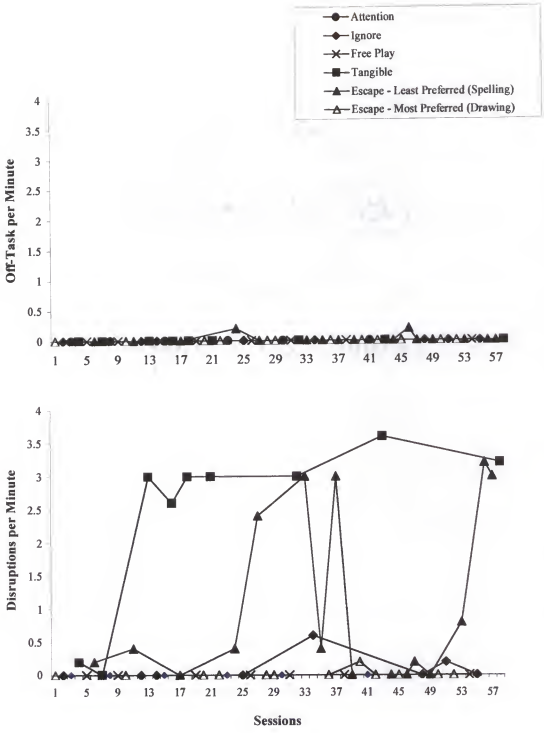

Figure 4-4: Rate of off-task (top panel) and disruptions (lower panel) per minute for Rachel

following directives to complete the least preferred task (M = 36%) compared to the most preferred task (M = 0%). Data on the percentage of directives followed by compliance

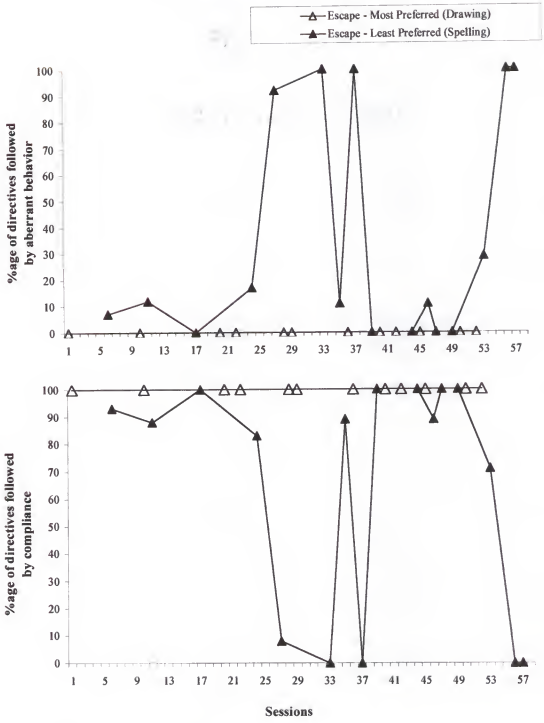
Escape - Most Preferred (Drawing)
Escape - Least Preferred (Spelling)
%age of directives followed by aberrant behavior
%age of directives followed by compliance
Sessions

Figure 4-5: Percentage of directives followed by aberrant behavior (top panel) and compliance (lower panel) for Rachel

are presented in the lower panel. Rachel was compliant following all of the directives presented during the most preferred escape condition (M = 100%). She was much less

compliant during the least preferred task (M = 64%). These results indicated that task preference did indeed influence Rachel's compliance and rate of aberrant behavior during the functional analysis. She was more compliant and less likely to engage in aberrant behavior when directives to complete a more preferred task (drawing) were presented compared to a less preferred task (spelling). These results are consistent with the previous finding that Rachel's disruptive behavior is partially maintained by escape from less preferred tasks.

Charlie

During Charlie's functional analysis, seven conditions were evaluated: attention, free play, tangible, ignore, most preferred escape (drawing), least preferred escape duration (copying definitions) and least preferred escape forced-choice (spelling). Results of Charlie's analysis are presented in Figure 4-6. Disruptions are displayed in the top panel, noncompliance in the middle panel, and aggression in the lower panel. The highest rate of disruptions occurred in the tangible condition (M = 1.8/min) followed by the least preferred escape duration (copying) condition (M = 1.4/min). However, visual analysis of the data demonstrated that as the analysis progressed, lower rates of disruptions occurred in the tangible condition compared to the least preferred escape duration (copying) condition. Therefore, at the conclusion of Charlie's functional analysis, disruptions were maintained primarily by escape from the least preferred task identified by the duration-based assessment (copying definitions). Lower rates of disruptions occurred in the ignore condition (M = 0.3/min), least preferred escape forced-choice (spelling) condition (M = 0.2/min), most preferred escape (drawing) condition (M = 0.08/min), attention condition (M = 0.05/min), and free play (M = 0/min).

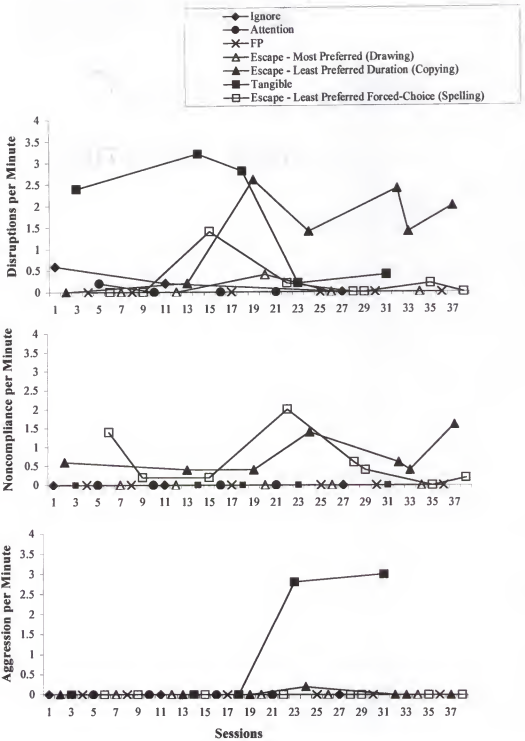

Figure 4-6: Rate of disruptions (top panel), noncompliance (middle panel) and aggression (lower panel) per minute for Charlie

Charlie's noncompliance occurred at higher rates during the least preferred escape duration (copying) condition (M = 0.8/min) followed by the least preferred escape forced-choice (spelling) condition (M = 0.6/min). Charlie did not engage in noncompliance during the escape most preferred (drawing) condition (M = 0/min). Noncompliance only occurred in the escape conditions, as these were the only instances in which demands/requests were given. Thus, the average rate of noncompliance in the attention, ignore, free play, and tangible conditions was 0/min. Visual analysis indicated that Charlie's noncompliant behavior was maintained by escape from the least preferred demand identified by the duration-based preference assessment (copying definitions).

Aggression occurred very rarely throughout the analysis. Charlie engaged in the highest rate of aggression during the tangible condition (M = 1.2/min). Lower rates of aggression occurred during the least preferred escape duration (copying) condition (M = 0.03/min). Aggression did not occur during the attention, free play, ignore, least preferred escape forced-choice (spelling), or most preferred escape (drawing) conditions (M = 0/min). Visual analysis suggested that Charlie's aggressive behavior was likely maintained by gaining access to tangible items.

A second graph was constructed to more specifically examine Charlie's behavior during the escape conditions. Data on the percentage of directives followed by Charlie's aberrant behaviors (top panel) and his compliance (lower panel) are presented in Figure 4-7. Charlie engaged in aberrant behavior most often following directives to complete the least preferred duration (copying) task (M = 82%). He was less likely to engage in aberrant behavior following requests to complete the least preferred forced-choice (spelling) task (M = 33%) and never engaged in aberrant behavior following directives to

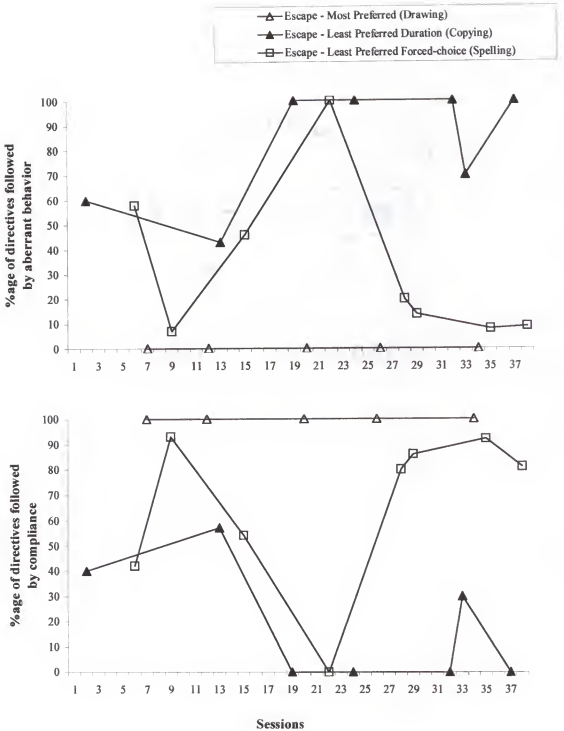
Escape - Most Preferred (Drawing)
Escape - Least Preferred Duration (Copying)
Escape - Least Preferred Forced-choice (Spelling)
%age of directives followed by aberrant behavior
%age of directives followed by compliance
Sessions

Figure 4-7: Percentage of directives followed by aberrant behavior (top panel) and compliance (lower panel) for Charlie

complete the most preferred (drawing) task (M = 0%). Conversely, data on compliance demonstrated that Charlie was compliant following 100% of the directives presented for

the most preferred task. He was less compliant during the least preferred forced-choice (spelling) task (M = 66%) and least compliant during the least preferred duration (copying) task (18%). These results indicated that Charlie was less compliant and more likely to engage in aberrant behavior when less preferred demands were presented, in particular the least preferred demand identified by the duration-based preference assessment, compared to more preferred demands. Copying definitions appeared to elicit less compliance and more aberrant behavior from Charlie than spelling. These results are consistent with previous findings that Charlie's disruptive and noncompliant behavior were maintained by escape from the least preferred task (copying definitions), as identified by the duration-based demand preference assessment. These findings also indicate that copying is less preferred than spelling.

Wayne

Seven functional analysis conditions were conducted with Wayne: attention, free play, tangible, ignore, most preferred escape (cutting out pictures), least preferred escape duration (counting), and least preferred escape forced-choice (picture identification). Data on each of Wayne's 3 aberrant behaviors were graphed separately. Results of Wayne's functional analysis for aggression (top panel), self-injurious behavior (middle panel), and disruptions (lower panel) are presented in Figure 4-8. Aggression did not occur during the analysis (M = 0/min for all conditions), therefore the factors maintaining Wayne's aggression at school were not able to be determined.

The highest rates of self-injurious behavior occurred in the free play, or control, condition (M = 0.5/min). Wayne engaged in self-injurious behavior at lower rates during the attention condition (M = 0.2/min), tangible condition (M = 0.06/min), ignore

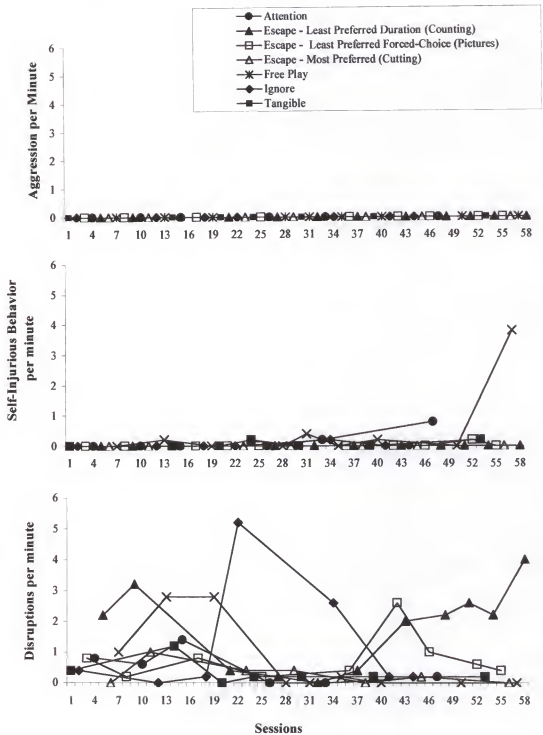

Figure 4-8: Rate of aggression (top panel), self-injurious behavior (middle panel), and disruptions (lower panel) per minute for Wayne

condition (M = 0.03/min), and least preferred escape forced-choice (pictures) condition (M = 0.02/min). Self-injurious behavior did not occur during the most preferred escape

(cutting) condition or the least preferred escape duration (counting) condition (M = 0/min). Since Wayne engaged in self-injury at highest rates during the control condition, in which all reinforcers were made available, the factors maintaining his behavior remain unclear. Given that Wayne's self-injurious behavior occurred at the highest rate in the absence of reinforcement, it may be maintained by automatic, or self-stimulatory, reinforcement. However, because self-injury occurred at such low rates throughout the assessment, there is not enough data to draw a definitive conclusion regarding its function.

Wayne engaged in disruptive behavior during all 7 conditions. The highest rate of disruptions occurred during the least preferred escape duration (counting) condition (M = 1.8/min) followed by the ignore condition (M = 1.3/min). Moderate rates of disruptions also occurred during the least preferred escape forced-choice (pictures) condition (M = 0.8/min) and free play condition (M = 0.8/min). Lower rates of disruption occurred during the attention condition (M = 0.5/min), most preferred escape condition (M = 0.3/min), and tangible condition (M = 0.3/min). Visual analysis indicated that Wayne's disruptive behavior was maintained by escape from the least preferred demand, identified by the duration-based assessment (counting).

Data on the percentage of directives followed by compliance and aberrant behavior, during Wayne's escape conditions, are presented in Figure 4-9. The top panel displays the percentage of directives followed by aberrant behavior, while the lower panel depicts the percentage of directives followed by Wayne's compliance. Wayne engaged in aberrant behavior more often when prompted to complete the least preferred duration (counting) task (M = 35%), compared to the least preferred forced-choice

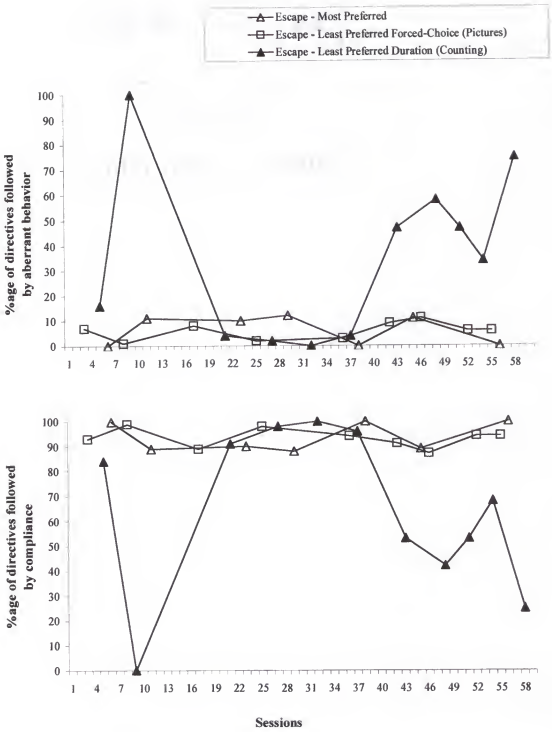
Escape - Most Preferred
Escape - Least Preferred Forced-Choice (Pictures)
Escape - Least Preferred Duration (Counting)
%age of directives followed by aberrant behavior
%age of directives followed by compliance
Sessions

Figure 4-9: Percentage of directives followed by aberrant Behavior (top panel) and compliance (lower panel) for Wayne

(pictures) task (M = 6%) or the most preferred (cutting) task (M = 6%). The percentage of compliance followed a similar pattern. Wayne was compliant following most of the

directives to complete the most preferred task (M = 94%) and the least preferred forced-choice (pictures) task (M = 94%). Less compliance occurred following directives to complete the least preferred duration (counting) task (M = 65%). These results indicated that task preference influenced Wayne's behavior during the escape conditions of the functional analysis. However, he was as compliant during the least preferred task (pictures), identified via the forced-choice assessment, as during the most preferred task. Therefore, it appeared, based on Wayne's behavior during the analysis, that counting (duration-based) was most likely less preferred than pictures. These data are consistent with the previous finding that Wayne's highest rates of disruptive behavior occurred during the least preferred duration (counting) task.

Summary of Functional Analysis Results

In summary, results of the functional analysis for all 3 participants indicated that task preference did influence functional analysis findings. For each student, escape from least preferred demands was identified as maintaining at least one behavior, while none of the students' behaviors were maintained by escape from most preferred demands. Also, in all 3 cases, a higher percentage of directives were followed by compliance during the most preferred, compared to the least preferred, tasks.

Results of the functional analyses for Charlie and Wayne, in which two least preferred demands were presented, provided evidence that the duration-based demand preference assessment was more effective than the forced-choice demand preference assessment in identifying a least preferred task. For both participants, the least preferred task identified by the duration preference assessment elicited higher rates of aberrant behavior and less compliance than the least preferred task identified via forced-choice.

CHAPTER 5
DISCUSSION

Overview

In 1990, federal legislation, for the first time, recognized children diagnosed with ASD as being eligible for special education services. Recent reauthorizations of IDEA (1997) have led to the increased inclusion of students with disabilities in less restrictive environments, most ideally the general education setting. However, students with ASD are more likely than their nondisabled peers to exhibit a variety of aberrant behaviors, which can pose a challenge for educators using traditional classroom management techniques. Federal law now requires that a functional behavior assessment (FBA) be conducted for any student with a disability who experiences a suspension, or change in placement, due to behavioral problems. Over the last decade, researchers have begun to examine the effectiveness of functional analyses outside of the clinical setting. However, given these current trends in education legislation, studies utilizing functional analysis technology in more natural settings, such as schools, continue to be warranted.

Recent research on functional analysis has demonstrated that, for some individuals, specific qualities of reinforcement, not traditionally manipulated in a functional analysis, may maintain aberrant behavior. The type of attention provided, tangible item available, and demand presented during a functional analysis have all been shown to influence results (Fisher et al., 1996; Mueller et al., 2001; Smith et al., 1995).

In addition, epidemiological studies have most commonly identified negative reinforcement (escape) as the primary reinforcer maintaining aberrant behavior (Derby et al., 1992; Iwata, Pace, Dorsey et al., 1994). While the prevalence of negative reinforcement functions has been identified, there remains no universal pre-assessment procedure designed to systematically select the demands presented during functional analysis sessions. This remains a concern because different characteristics of demands have shown an effect on aberrant behavior.

One aspect of demands that has been found to influence rates of aberrant behavior for some individuals, but that has not been studied in the context of a functional analysis is demand preference. For example, several studies have demonstrated lower levels of problem behavior when preferred demands are presented vs. when less preferred demands are presented (Foster-Johnson et al., 1994; Vaughn & Horner, 1997). However, when designing a functional analysis, the demand most aversive to each individual is typically selected, although no consistent method for making this selection has been identified. It remains unclear whether it is possible to identify behavior maintained by escape from demands using more preferred tasks. The use of less aversive demands could potentially reduce the rates of aberrant behavior elicited during the analysis and thus increase acceptance of the technique.

In order to evaluate the influence of demand preference on functional analysis results, a method to assess demand preference must first be selected. However, a review of previous research demonstrated that although numerous studies have addressed the assessment of stimulus preference, few have systematically evaluated preference for demands. Procedures most commonly used to assess task preference include caregiver or

teacher report and student choice or ranking of demands (Cole et al., 1997; Cooper et al., 1992; Green et al., 1988; Green et al., 1991; Reid, Everson, & Green, 1999). However, for students who may have difficulty expressing preference or whose behavior may be maintained by escape from demands, choice may not be the best option for assessing demand preference because they may view all task choices as aversive. Studies examining the accuracy and reliability of caregiver and teacher report have produced inconsistent findings, with the majority of studies indicating that caregiver/teacher report is insufficient to predict an individual's actual preference. For example, Reid et al. (1999) and Green et al. (1988) found caregiver report to be inadequate when compared to direct assessment of stimulus preference based on individuals' approach behaviors. Caregiver report matched systematic preference assessment results less than 50% of the time.

Several researchers have begun to examine alternative methods for evaluating stimulus preference based on the duration of time individuals spend engaged with materials (DeLeon et al., 1999). However, these techniques have only recently been applied to the assessment of demand preference. For example, Worsdell, Iwata, and Wallace (2002) used partial-interval recording of engagement in vocational tasks to examine demand preference. They compared single-stimulus presentation of tasks to multiple-stimulus presentation and found that when presented with multiple tasks, individuals primarily engaged in one task. Thus, multiple-stimulus presentation was effective in identifying a most preferred task but not a least preferred task. However, when presented with single tasks, participants typically engaged in whichever task was presented, making it difficult to differentiate preference. Engagement was defined

broadly to include manipulating materials in a task-related manner, rather than actively completing the task, which may have contributed to the undifferentiated results. Therefore, numerous questions remain regarding the most effective method to determine demand preference.

This study was conducted to extend the ABA literature in several areas. First, this study attempted to continue the application of functional analysis to more natural settings, by targeting the aberrant behaviors of students with ASD included in the general education setting. Although the analyses were not conducted in the actual classroom setting, they were conducted at school for each participant. Second, a novel methodology was developed for assessing demand preference, based on the duration of time students spent on- and off-task when presented with various demands, as well as the frequency of aberrant behavior. This new procedure was then compared to two more traditional preference assessment approaches: an experimental forced-choice demand preference assessment and teacher ranking of demand preference. The reliability of teacher rankings across time was also examined. Finally, tasks identified as most and least preferred by the two experimental demand preference assessments were included as part of the escape condition of a functional analysis, to evaluate the influence of demand preference on functional analysis results.

Interpretation of Results

This study set out to answer five research questions. First, are teachers' reports of students' task preference in agreement with observed student task preference based on an experimental duration-based demand preference assessment? Results indicated that initial teacher rankings were more in agreement with the duration-based assessment

regarding the task identified as most preferred, compared to least preferred. Initial teacher rankings of the most preferred task matched experimental duration-based results for two participants. Regarding the least preferred task, initial teacher rankings were not in agreement with the duration-based preference assessment for any of the 3 participants. Results for the other 4 tasks were mixed; there were several agreements and disagreements for each participant. Therefore, it appears that teachers were best able to identify tasks with which students spent more time actively on-task and engaged in less aberrant behavior from a list generated according to specific criteria. They were less accurate in reporting tasks with which students were most off-task. However, teachers were least accurate in ranking tasks with which students were more moderately on- and off-task. Agreement between final teacher rankings and the duration-based assessment were inconsistent. Rankings for Charlie were somewhat in agreement (results matched for 3 of the 6 tasks); however, rankings for Wayne were not (results matched for only 1 task).

Results also indicated that neither set of teacher rankings (initial or final) were conclusively more in agreement with the duration-based demand preference assessment. For Charlie, initial teacher rankings were more in agreement with duration-based rankings (results matched for 4 of the 6 tasks compared to final ranking results which matched for only 3 tasks). However, Wayne's final teacher rankings matched duration-based assessment results for one task, while initial rankings did not match duration-based findings for any of the tasks.

A second question addressed by this study involved whether teachers' reports of students' task preference were in agreement with results of an experimental forced-choice

demand preference assessment. As with the duration-based demand preference assessment, teachers' reports were more consistent with the forced-choice preference assessment regarding the most preferred task. Initial teacher rankings were in agreement with forced-choice results on the most preferred task for two of the three participants; they were not in agreement regarding the least preferred task for any of the participants. There was more agreement between Charlie's initial teacher rankings and results of the forced-choice assessment (rankings matched for 2 of the tasks) compared to his final teacher rankings (none of the rankings were in agreement). Neither of Wayne's teacher rankings was in agreement with forced-choice results. Thus, the time at which teacher rankings were obtained (initial or final) did not appear to significantly influence the degree of agreement between such rankings and results of the forced-choice demand preference assessment.

Overall, there was less agreement between teacher rankings and results of the forced-choice assessment compared to the duration-based preference assessment. This indicated that teachers appear to have more accurate knowledge of actual student behavior (e.g., on-task, off-task, aberrant behavior) than which tasks students would choose if given the choice. This finding is consistent with teachers' experiences, as most have more opportunity to observe student behavior rather than student choice. However, it is important to note that the teachers did not make these rankings based on a list of tasks they generated on their own, but from the highly selective list developed for this study. It would be interesting to compare their rankings of tasks, generated on their own, to those selected based on the two types of experimental demand preference assessments.

It is also interesting to note that teacher rankings did not remain stable across time for either of the participants. It is unclear whether the students' task preference changed across time (which for both participants was 6 to 8 weeks) or whether teachers' perceptions changed. A second demand preference assessment, conducted closer in time to the final teacher rankings (after the functional analysis) would have to have been conducted to answer that question.

The third question this study set out to answer was whether a duration-based demand preference assessment, combining measures of the duration of on- and off-task behavior as well as rates of problem behavior, was successful in identifying more preferred and less preferred tasks. Overall, the duration-based preference assessment was effective in differentiating task preference for all 3 participants. During the functional analysis, tasks identified as most preferred produced lower rates of aberrant behavior than those identified as least preferred, which provides support for the validity of the results. Preference rankings for the 6 tasks varied during the initial assessment sessions for each student. Additional sessions, beyond the minimum five, were necessary for 2 of the 3 participants in order to meet stability criteria for the most and least preferred tasks. Thus, although it was effective, the duration-based demand preference assessment was time-consuming in that several days of assessment were required with each participant. However, results obtained from the duration-based demand preference assessment demonstrated the best correspondence, compared to the other assessments, to participants' engagement or nonengagement in the task demand, as evidenced by each student's performance in the most and least preferred task presented during the functional analysis.

The duration-based demand preference assessment appeared to produce more valid results than the forced-choice demand preference assessment. For example, in both cases where the two experimental demand preference assessments identified different tasks as least preferred (Charlie and Wayne), the tasks identified as least preferred by the duration-based demand preference assessment elicited higher rates of aberrant behavior (and lower rates of compliance) than those identified as least preferred by the forced-choice method. Therefore, based on student behavior, the tasks identified by the duration-based procedure appeared to be less preferred. In summary, results of the duration-based preference assessment were more valid in that they were a better reflection of student behavior, as observed during the functional analysis.

The fourth question addressed by this study involved whether results of a duration-based demand preference assessment were in agreement with results of a forced-choice demand preference assessment. Similar to the other comparisons discussed previously, results of the two experimental demand preference assessments were more in agreement regarding the most preferred task for each participant. For all 3 students, the same tasks were identified as most preferred by both preference assessment methods. The tasks identified as least preferred were only consistent for 1 of the 3 participants. Results for the rankings of the other tasks were mixed; there were several agreements but more disagreements for each participant. Overall, these results indicated that student choice was as accurate and reliable, compared to the other methods, in assessing which demands were most preferred. However, results of the forced-choice assessment were less valid, compared to the duration-based method, regarding tasks that were least preferred. The forced-choice method developed by Fisher et al. (1992) simply relied on

the individual selecting an item from two available choices. Approach and response were the only categories of behavior recorded or considered for evaluation of preference. While this has often been demonstrated to be a reliable method for stimulus preference, others such as Derby et al. (1995) have demonstrated that evaluating preference with consideration given to the occurrence of aberrant behavior during item engagement may enhance item selection outcomes. In summary, the duration-based experimental demand preference assessment took into consideration on-task, off-task, and aberrant behavior during engagement with each item individually, rather than simply approach or choice. As such, it appears that when evaluating demand preference, data on behaviors beyond approach and selection are more critical to accuracy in identifying most and least preferred demands.

The final question this investigation set out to answer was whether there were differences in functional analysis outcomes when the most and least preferred tasks, identified via the experimental preference assessments, were presented during the escape condition. Results confirmed that task preference did influence functional analysis results. For all 3 participants, higher rates of aberrant behavior and less compliance occurred during the least preferred tasks. Escape from least preferred demands was found to maintain at least one aberrant behavior for each student, while none of the students' behaviors were found to be maintained by escape from most preferred tasks. Therefore, it appears that a negative reinforcement function will only be identified when the task demands presented during the functional analysis are least preferred.

The tasks identified as most preferred by the two experimental demand preference assessments were identical for all participants, and thus only one most preferred escape

condition was conducted with each student. However, two different least preferred tasks were identified for two of the participants (Charlie and Wayne). For both of these students, the task identified as least preferred by the duration-based preference assessment elicited higher rates of aberrant behavior and thus, appeared less preferred than the task identified by the forced-choice assessment. Thus, as indicated previously, the forced-choice demand preference assessment was unable to predict functional analysis outcomes, in comparison to the duration-based assessment.

Implications

In summary, the findings from this investigation suggest that assessing demand preference based on behaviors individuals display when presented with various tasks (e.g., duration of time on- or off-task, frequency of aberrant behavior) is more accurate and predictive of future behavior than traditional forced-choice methods or teacher report. Choice and teacher report appeared to be effective for identifying tasks students most preferred, but less valid in differentiating which tasks they least prefer, which is the essence of how the escape condition of the functional analysis is conducted. These results are an important contribution to the literature because they indicate that in order to accurately evaluate demand preference, systematic, unique procedures may need to be developed, distinct from methods traditionally used to assess stimulus preference.

Although the results of this study support the current practice of selecting aversive, less preferred demands for use in functional analyses, it suggests that the manner in which those selections are made can be improved. It appears necessary to utilize less preferred demands in the escape condition in order to determine if behaviors are maintained by negative reinforcement. Although negative reinforcement was found

to maintain some of the behaviors for all 3 participants, this would not have been discovered if only the most preferred tasks had been presented. In order to most clearly understand the variables maintaining aberrant behavior, it appears necessary to elicit higher rates of such behavior by presenting less preferred demands, as opposed to more preferred tasks.

However, it is important for researchers to consider the possibility that the current practice of presenting more aversive demands during functional analyses may have contributed to the finding that negative reinforcement is the most commonly identified function of aberrant behavior (Iwata, Pace, Dorsey et al., 1994). This study demonstrates that when more preferred demands were presented, negative reinforcement did not emerge as the function of aberrant behavior. It is unclear whether, in some cases, presenting less preferred demands in a functional analysis, artificially elicits a negative reinforcement function, rather than detecting one. Future research may need to focus on the factors contributing to the aversiveness of tasks typically selected for functional analyses (such as preference) and how such variables influence the results obtained.

On average, the duration-based demand experimental preference assessment took approximately 5 days. Only one to two duration-based demand preference assessment sessions were conducted each day in this study. It is possible that more than two sessions per day could be conducted, cutting the number of days to less than 3. However, one logical question to ask is, under what conditions does the use of this procedure appear warranted? The issue first addressed in the literature review focused on the fact that all other functional analysis conditions have an identified systematic pre-assessment procedure for the selection of materials (free play and tangible conditions) and for how to

conduct the attention condition. The same cannot be said for the escape condition. It appears that it would make sense to conduct this type of assessment when descriptive information leads to the hypothesis that negative reinforcement is maintaining aberrant behavior. Researchers typically rely on caregiver or teacher report to determine which tasks are most aversive for an individual. This study added to the growing literature that demonstrates that relying on caregiver/teacher reports of student preference for stimulus items or less preferred task demands is inadequate. There are costs in terms of time and additional resources required to conduct a systematic duration-based demand preference assessment, however, they appear justified based on the increased clarity regarding the identification of a least preferred task.

This investigation also extended the literature by providing evidence that demands presented in a functional analysis need not be difficult in order to determine if behavior is maintained by negative reinforcement. None of the tasks used in this study were difficult (students were able to obtain 80% accuracy or greater independently during practice) yet those identified as least preferred elicited higher rates of aberrant behavior for all 3 students. Therefore, even with task difficulty controlled, task preference appeared to influence functional analysis outcomes. This provides evidence that increased difficulty need not be part of the criteria researchers pursue when identifying aversive demands for presentation in a functional analysis. Result of this study indicated that manipulating task preference alone, rather than difficulty, was sufficient to elicit higher rates of aberrant behavior and identify a negative reinforcement function. Thus, selecting demands for a functional analysis that are too difficult for an individual to complete independently may produce unnecessary frustration and should be avoided.

Limitations and Extensions

Limitations

The results of this study contribute to the literature in several areas including: the application of functional analysis technology to the assessment of aberrant behaviors occurring in the school setting, the influence of demand preference on functional analysis outcomes, and the systematic assessment of demand preference. However, there are seven limitations that should be taken into account when interpreting these findings. First, it remains unclear why teacher rankings changed across time for Charlie and Wayne. Although the change in rankings may simply reflect changes in teacher perceptions, the variations may also indicate actual changes in student demand preference. Because a second demand preference assessment was not conducted following the functional analysis, when the second teacher rankings were obtained, actual student preference at the end of the functional analysis remains unknown. It is possible that the repeated presentation of several of the tasks during the functional analysis may have influenced student preference for the tasks. Future replications of this study should include a second demand preference assessment to determine if student preference remains consistent across time.

A second limitation of this study was the possible influence of several establishing operations on the results of the experimental demand preference assessments and the functional analysis. For example, Smith et al. (1995) demonstrated that task novelty, session length, and the rate of task presentation influence the rate of aberrant behavior for some individuals. Although tasks in this study were chosen so that they were as similar as possible on all dimensions, selection procedures were not stringent

enough to rule out the possible effect of some of these establishing operations. For example, tasks were chosen so that they were similar with regards to novelty. However, some students may spend more time reading or drawing at home or in their free time than others. Some of these tasks may have been more or less familiar to the students than intended. The rate of task presentation was also difficult to control, as each task varied in presentation format and response modality. For example, students often took much more time to draw a picture than to spell a word or complete a math problem, and thus more of the latter items were presented during each session. In order to conclusively remove the influence of these known establishing operations, and ensure that demand preference is being assessed rather than other task characteristics, future studies would have to more specifically control for each one. For example, to control the rate of task presentation, all items could have been presented at the exact same rate regardless of whether an individual finished early or ran out of time.

The third and fourth limitations of this investigation involved the list of tasks generated during the descriptive assessment. First, interobserver agreement was not collected on the process of generating the list of tasks for each student and narrowing them down to the six manipulated in the demand preference assessments. Although the criteria for task selection were described in the methods (e.g., nonacademic tasks were removed, tasks were selected so they were similar with regards to novelty and variable with regards to response modality etc.) it remains unclear whether a second observer would have selected the same 6 tasks for each student. For example, different observers may not have considered all of the tasks used in this study academic or those eliminated nonacademic. The terms "academic" and "nonacademic" may not be the best descriptors

to differentiate the tasks. It would have been informative to have data on the reliability of the task selection process, given the influence of the 6 tasks selected on the ultimate results of the study. On a related note, comparison of teacher generated most and least preferred tasks with and without use of the list generated through descriptive assessment would have also been useful. In this study, teachers were asked to rank order student preference for tasks, however, the tasks had already been identified by the examiner. Thus, teacher perceptions were narrowed to the six tasks selected for manipulation, rather than based strictly on their own views of which tasks the students most and least preferred.

The fifth and sixth limitations of this study are related to the participants. First, only three students participated in this investigation. Results would have been more compelling and conclusive had they been replicated with additional participants. For example, 2 of the 3 participants had different least preferred tasks generated from each type of experimental demand preference assessment. It would have been useful to see how often this occurred with other individuals to help confirm the results obtained in this study, that the least preferred task identified by the forced-choice method did not match the functional analysis outcomes. Future studies are needed, using larger numbers of individuals, to further investigate the external validity of these findings. Another limitation is that several of the students' aberrant behaviors occurred at such low frequencies during the functional analysis that a function could not be detected. Had the analysis been continued longer, it is possible that the factors maintaining these behaviors may have been determined.

The final limitation involved the order in which the experimental demand preference assessments were conducted. For all 3 participants, the duration-based demand preference assessment was conducted prior to the forced-choice demand preference assessment. Given the potential influence of establishing operations such as task novelty and satiation, it is possible that the order of the assessments influenced the results. The tasks were more familiar to the students during the forced-choice assessment, as they had already been presented numerous times. Although time was allotted between assessments (the forced-choice assessment was conducted at least 1 week following the completion of the duration-based assessment) the students may have been satiated with some of the tasks. If the order of the assessments had been counterbalanced with at least one participant, and the same results obtained, the effects would be more convincing. Future replications of this investigation should attempt to counterbalance the demand preference assessments to reduce potential order effects.

Extensions

Based on the results of this study and a review of the literature, there are several research areas that warrant further investigation. First, additional research is needed to investigate new approaches, such as the one described in this study, for systematically evaluating demand preference. Results of this study indicated that traditional stimulus preference assessment approaches such as forced-choice and caregiver report are not the most effective method for assessing preference for demands. Research should focus on more innovative measures, such as the duration of time on-task, to ensure that demand preference, rather than preference for the stimuli required for the demand, is evaluated. This investigation identified one methodology that was consistently accurate in

identifying most and least preferred task demands (duration-based assessment), however, it was a time-consuming process. It is possible that certain features of the methodology described here, such as duration and aberrant behavior, could be utilized in another way that takes less time and effort to evaluate. Regardless, it appears clear that a more systematic approach to task demand selection for the escape condition is warranted, and future research should continue to expand upon these findings.

Additional research is also needed to investigate why teacher rankings did not remain consistent across time. It is unclear whether students' preference for demands changed across time or whether teachers' perceptions fluctuated. It is also possible that repeated exposure to the tasks during the preference assessments and functional analysis influenced student preference (e.g., satiation) and the change in teacher rankings, for Charlie and Wayne, reflected this. One suggestion to address this question is to replicate this study with the inclusion of a second experimental demand preference assessment following the functional analysis so that all 3 assessments can be compared across time. Such research could help clarify whether demand preference changes over time, with repeated exposure to the tasks. If preference for tasks changes, results of demand preference assessments may only be valid for a short period of time. This information would be useful for researchers and educators to have so that they can make decisions about individuals based on current information rather than past preferences.

Further research attempting to replicate this investigation should counterbalance the order of the preference assessments with the participants. The differences in results between the forced-choice and duration-based preference assessments would have been more compelling if they occurred regardless of the order in which the assessments were

conducted. Before research can clearly distinguish which method is most valid for evaluating demand preference, the possibility of order effects must be controlled.

Researchers planning to replicate or extend this study should also evaluate the criteria used to rank order tasks during the duration-based demand preference assessment to determine if they are the best measure of preference. In particular, the mean preference ranking across days was selected as one of the criteria used to rank order the tasks. However, different rankings would have been obtained had the median, or mid-point, of the rankings been used as opposed to the mean or average. Given that the rankings involved ordinal data and either the mean or median could have been used to measure central tendency, it remains unclear which of the two is the most appropriate measure of preference.

Future research should also continue to examine specific aspects of functional analysis conditions to determine what additional variables may influence behavior during assessment. A clearer understanding of all the potential aspects of the analysis that may influence results (e.g., task preference) could lead to more accurate, efficient assessment and ultimately to the development of more effective interventions. On a related note, one area that may be of interest for future investigation is the influence of more moderately preferred tasks on functional analysis outcomes. This study only investigated the impact of the tasks identified as most and least preferred (ranking of 1 or 6) on functional analysis results. It remains unclear whether the tasks with a ranking of 5 (still less preferred but not the least preferred) would have elicited similar rates of aberrant behavior or whether the tasks ranked 2 (preferred but not the most preferred) would have elicited as much compliance. Research should examine the influence of more moderately

preferred tasks (or at least those not at the extreme preference rankings) on functional analysis outcomes.

Finally, given the increased compliance and reduced rates of aberrant behavior when the most preferred tasks were presented, research should examine incorporating more preferred tasks during treatment for escape-maintained aberrant behavior. Introducing an intervention with more preferred tasks may help individuals learn the new contingencies quickly (e.g., receive reinforcement for compliance). This may reduce the typical elevations in behavior, or extinction burst, often observed when less preferred demands are presented without allowing the individual to escape. Results of the functional analysis for the most and least preferred tasks were not validated with a treatment analysis and ideally should be. Based on behavior observed during the functional analysis, if treatment had been implemented using the most preferred task first, low rates of aberrant behavior would have been predicted to occur along with high rates of compliance. Thus, the students would have had frequent exposure to reinforcement. Next, treatment could have been implemented using the least preferred task and elevations in aberrant behavior would likely have occurred, but may have been lower than those observed in the functional analysis because the students would have already been exposed to a more appropriate, alternative response (e.g., completing a few items to earn a break). Such results would have validated the accuracy of the duration-based demand preference assessment in identifying most and least preferred tasks as well as provided another example of when such an assessment is useful.

Summary

Although the literature on stimulus preference assessment is expansive, few research studies to date have attempted to systematically assess preference for demands. Those studies that have evaluated demand preference have typically adapted methods traditionally used to assess stimulus preference, such as forced-choice or caregiver report. The results of this investigation suggested that new measures, such as the duration of time individuals actually engage in each task as directed, as well as the amount of aberrant behavior during the task, may be a more valid indicator of demand preference. Further research is needed to continue the development of techniques more suited to the systematic assessment of demand preference.

Research has also demonstrated that specific aspects of functional analyses may influence results for some individuals, such as the quality of attention provided or aspects of the tasks presented. However, no previous studies have examined the influence of task preference on functional analysis outcomes. This investigation has extended the literature on functional analysis by demonstrating that task preference does influence functional analysis results. These findings also suggest that until a valid, alternative method of identifying demand preference is identified, use of this duration-based experimental demand preference assessment appears warranted for individuals whose behavior is hypothesized to be maintained by negative reinforcement.

APPENDIX A
COMPLETE LIST OF TASKS OBTAINED DURING DESCRIPTVE ASSESSMENT

RACHEL	
Complete List of Tasks Identified During Phase 1: Descriptive Assessment	**Academic Tasks Identified During Phase 1: Descriptive Assessment**
Direct Observation • Spelling words on paper • Assembling puzzles • Spelling words orally • Listening to a story using headphones while looking at book • Playing a computer game • Worksheet on coin identification • Coloring pictures • Assembling a Valentine's Day Card (color, cut, paste) • Playing with a sand tray • Playing with dolls • Singing a song with the class • Coin identification (group instruction) • Worksheet (coloring and cutting out pictures)	• Spelling (written or orally) • Coloring pictures • Cutting • Pasting • Coin identification (worksheet or orally) • Writing (free writing or copying) • Drawing • Painting • Math addition • Reading
Teacher Interview – Preferred Activities • Writing (free writing) • Art Activities (painting, coloring, drawing, cutting, pasting) • Floor puzzles • Dramatic play with dolls (dress-up) • Action songs (movement of hands/body) • Computer games Teacher Interview - Nonpreferred Activities • Listening to stories (headphones) • Math addition (answer < 10) • Reading • Writing (copying sentences)	

CHARLIE	
Complete List of Tasks Identified During Phase 1: Descriptive Assessment	**Academic Tasks Identified During Phase 1: Descriptive Assessment**
Direct Observation • Science worksheets • Group science lesson • Writing a story on lined paper • Typing a story on the computer (from handwritten copy) • Reading aloud • Reading to self • Spelling test • Drawing pictures (to illustrate a worksheet) • Watching a video • Singing in large group • Sharing stories in large group	• Science (completing worksheets) • Writing (free writing) • Typing (from handwritten copy) • Reading • Spelling (writing answer) • Drawing • Coloring • Copying written work • Defining words (writing out definition) • Math (3-digit regrouping)
Teacher Interview – Preferred Activities • Science • Art (drawing or coloring) • Reading (silent/oral) • Group discussion/sharing time Teacher Interview – Nonpreferred Activities • Written work/handwriting • Copying written work • Defining words (looking up definitions in a dictionary and copying them on paper) • Math computation - (3-digit regrouping)	

WAYNE	
Complete List of Tasks Identified During Phase 1: Descriptive Assessment	**Academic Tasks Identified During Phase 1: Descriptive Assessment**
Direct Observation • Looking at books (with aide) • Clean-up: Putting books, puzzles, or blocks away • Art projects (coloring, tracing, cutting, drawing, pasting) • Playing with blocks and Legos • Playing with dolls/puppets • Computer game • Assembling wood puzzles • Identifying pictures of common objects (e.g., tree) • Dancing and singing songs with aide or class • Letter identification (orally and visually) • Tracing name, letters, and numbers • Free writing with hand-over-hand guidance from aide • Identifying numbers (up to 9) • Counting to 9 (using manipulatives)	• Cleaning up items • Coloring • Tracing (letters and numbers) • Cutting • Drawing • Pasting • Assembling puzzles • Identifying pictures • Letter identification (by pointing or orally) • Identifying numbers • Counting (up to 9)
Teacher Interview - Preferred Activities • Music • Story time (books read to him) • Playing with puppets • Assembling puzzles • Computer games • Letter Identification (pointing to letters presented orally) • Cutting out pictures Teacher Interview - Nonpreferred Activities • Coloring • Writing • Art projects (with multiple steps) • Group sharing/circle time (sitting and listening)	

APPENDIX B
DESCRIPTION OF TASKS SELECTED FOR THE EXPERIMENTAL DEMAND PREFERENCE ASSESSMENTS

Rachel

Six Tasks Selected for Manipulation
During Phases 2 and 3

Reading

- Asked to read aloud from grade-level books
- Accuracy: Percentage of words read correctly out of those attempted

Copying

- Copying sentences presented on lined paper
- Accuracy: Percentage of words copied correctly out of those presented.

Fill-In (Writing/Spelling)

- Required to fill-in the missing first letter of a vocabulary word (e.g., __ ird for bird) presented on a worksheet
- Picture cue presented next to word (e.g. picture of a bird)
- Accuracy: Percentage of words completed correctly out of those presented

Spelling

- Words presented orally (word, sentence, word)
- Answer written on lined paper
- Accuracy: Percentage of words spelled correctly out of those presented

Math

- Addition (answer < 10)
- Problems presented on flashcards
- Verbal answer required; No paper provided
- Accuracy: Percentage of problems answered correctly out of those presented

Drawing

- Copying a picture presented on a worksheet
- Accuracy: Percentage of pictures copied correctly out of those presented

Charlie
Six Tasks Selected for Manipulation
During Phases 2 and 3

Reading
- Asked to read aloud from grade-level books
- Accuracy: Percentage of words read correctly out of those attempted

Writing
- Writing sentences on lined paper using given words
- Accuracy: Percentage of grammatically correct sentences written out of those attempted

Copying Definitions
- Asked to copy the definitions of words, presented on lined paper, out of a children's dictionary already opened to the correct page
- Accuracy: Percentage of definitions copied correctly out of those attempted

Spelling
- Words presented orally (word, sentence, word)
- Answer written on lined paper
- Accuracy: Percentage of words spelled correctly out of those presented

Math
- Addition and subtraction using 3-digit regrouping
- Problems presented on a worksheet
- Accuracy: Percentage of problems answered correctly out of those attempted

Drawing
- Drawing a picture to illustrate a given word presented on a worksheet
- Accuracy: Percentage of pictures drawn which correctly match the word out of the number of pictures attempted

Wayne
Six Tasks Selected for Manipulation
During Phases 2 and 3

Picture Identification
- Asked to provide the name of pictures of objects presented on worksheets
- Accuracy: Percentage of items correctly identified out of those presented

Tracing Letters
- Asked to trace lined outlines of capital letters (A-Z) presented on a worksheet
- Accuracy: Percentage of items traced correctly (following the lines) out of those attempted

Cutting Out Pictures
- Asked to cut out a picture of a simple shape presented on a worksheet
- Accuracy: Percentage of objects cut correctly (following lines and not cutting off parts of the shape) out of those presented

Puzzles
- Assembling wood puzzles (age-appropriate)
- Accuracy: Percentage of pieces placed in the correct place out of those attempted (touched)

Math
- Orally counting a series of checkers presented (ranging from 1 to 10)
- Accuracy: Percentage of checkers counted correctly out of those presented (each checker is considered one item)

Putting Away Objects
- Cleaning up a pile of plastic pegs (similar to Legos) by putting them into a plastic bin
- Accuracy: Percentage of pegs put into the container out of those touched/attempted

APPENDIX C
EXAMPLE TEACHER RANKING FORM

Task Preference Rating Form

Student _____ **School** _____

Teacher_____

Please rank the following tasks according to how much you think the student prefers them. Rank them from 1 to 6, with 1 being the most preferred task and 6 being the task the student least prefers to work on. *Make sure each task only receives one number and each number is only used once.*

Task	Rank
A. Putting a word into a sentence (writing)	_____
B. Math addition and subtraction Using 3 digit regrouping	_____
C. Drawing a picture to illustrate a word	_____
D. Reading aloud	_____
E. Copying definitions out of a dictionary	_____
F. Spelling words (Writing words presented orally)	_____

APPENDIX D
ACCURACY DATA FOR PRACTICE SESSIONS

Practice Data on Accuracy

Criteria for use in demand preference assessment = 80% or better

Rachel

Task	Accuracy
Reading	100%
Math	80%
Drawing	100%
Fill-in 1st Letter	100%
Spelling	100%
Copying Sentences	100%

Charlie

Task	Accuracy
Reading	100%
Math	100%
Drawing	100%
Writing	100%
Spelling	100%
Copying Definitions	100%

Wayne

Task	Accuracy
Picture Identification	100%
Tracing Letters	80%
Cutting	100%
Puzzles	100%
Counting	95%
Putting away Legos	100%

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BIOGRAPHICAL SKETCH

Julie Capasso Franzese was born in Fort Lauderdale, Florida in 1976 to Blase and Joanne Capasso. She has a younger sister, Jill. Julie completed her undergraduate degree at Florida Atlantic University in Boca Raton, Florida. She graduated summa cum laude in 1998 with a Bachelor of Arts degree in psychology. Upon graduation, Julie was awarded an Albert Murphee Presidential Fellowship to pursue her doctorate in school psychology at the University of Florida. During her time at the University of Florida, Julie worked as a research assistant on a grant designed to facilitate the inclusion of autistic children in the general education setting via applied behavioral analysis. In December of 2001, Julie received her Master of Arts degree. Julie married John Franzese in June of 2002. She is currently fulfilling her pre-doctoral internship requirements in a school-based setting in Broward County, Florida. Upon completion of her Doctor of Philosophy degree in school psychology, Julie plans to pursue employment that will allow her to make a difference in the lives of children.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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Assistant Professor of Educational Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Graduate Faculty of the College of Education and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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